9-1025-211-10

TM 9-1025-211-10

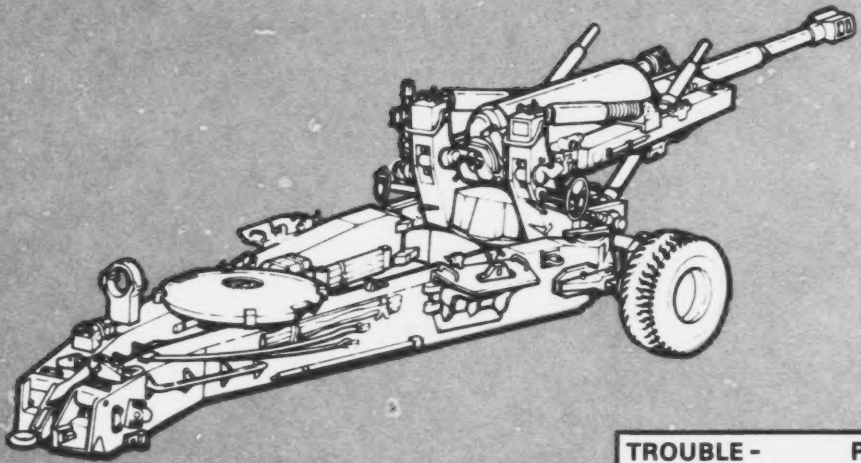
TECHNICAL MANUAL

PMCS PAGE 2-12

OPERATION PAGE 2-53

LUBING PAGE 3-1

OPERATOR'S MANUAL (CREW)



TROUBLE-SHOOTING PAGE 3-14

MAINTENANCE PAGE 3-31

FIRING PAGE 4-21

MISFIRE/CHECKFIRE PAGE 4-39

HOWITZER, MEDIUM, TOWED: 155-MM, M198 (1025-01-026-6648)

HEADQUARTERS, DEPARTMENT OF THE ARMY
OCTOBER 1979

This copy is a reprint which includes current pages from Changes 1 through 8.

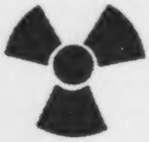
D101.11:

READEX FICHE best copy available

WARNING

All personnel that operate and/or maintain the howitzer must be aware of the following special precautions.

RADIATION HAZARD



Rules and Regulations

Copies of the following rules and regulations are maintained at HQ, AMCCOM, Rock Island, IL 61299-6000. Copies may be requested or information obtained by contacting the AMCCOM Radiological Protection Officer (RPO), AUTOVON (309) 793-2964, Commercial (309) 782-2964.

10CFR Part 19 - Notices, Instructions and Reports to Workers; Inspections.

10CFR Part 20 - Standards for Protection Against Radiation.

NRC license, license conditions, and license application.

Safety Precautions

The radioactive material used in this instrument is tritium gas (H_3) sealed in pyrex tubes. It poses no significant hazard to the repairman when intact. These sources illuminate the instrumentation for night operations. Tampering with or removal of the sources in the field is prohibited by Federal law. In the event there is no illumination, notify the local Radiological Protection Officer. Do not attempt to repair or replace the instrument in the field. If skin contact is made with any area contaminated with tritium, wash immediately with nonabrasive soap and water.

Identification

Radioactive self-luminous sources are identified by means of radioactive warning labels (as above). These labels should not be defaced or removed, and should be replaced immediately when necessary. Refer to the local RPO or the AMCCOM RPO for instructions on handling, storage, or disposal.

WARNING

☢

Storage

When radioactively illuminated instruments are defective, notify organizational maintenance. These items must be placed in a plastic bag (item 1, app D) and packaged in the shipping container. Spare equipment must be stored in the shipping container, as received, until installed on the weapon. Storage of these items is recommended to be in an outdoor shed-type storage or unoccupied building.

HOWITZER

General

The procedures in this technical manual involve the use of a weapon system and live ammunition. All standard safety precautions governing the handling of live ammunition and operation of artillery weapons must be observed.

AMMUNITION

Do not chamber ammunition except immediately prior to firing. When possible, fire or unload ammunition within 5 minutes after chambering. Ammunition left too long in a hot or warm weapon can result in cookoffs or inbore explosions which are hazardous to personnel. Use of ammunition other than that prescribed in this manual is prohibited.

HEARING PROTECTION

The M198 howitzer can generate blast overpressure which may damage hearing or cause injury to lungs or sinuses if proper protective measures are not followed. Supervised wearing of earplugs is required at all times, with the e-a-r type (plastic roll) preferred. The effects of blast can be reduced by moving further to the rear of the weapon. For this reason, all crew members not required to fire the weapon should move away as far to the rear as practicable. Any crewman who experiences such problems as shortness of breath or bleeding from nose or mouth must be immediately transported to a medical facility for evaluation.

Properly worn foam earplugs provide adequate protection when firing all existing propellant charges, including M203 series, at all quadrant elevations according to the guidelines in the chart on page 2-89.

FIRST AID

For further information on first aid, see FM 21-11.

TECHNICAL MANUAL
No. 9-1025-211-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, *1 October 1979*

Operator's Manual
(Crew)
for
HOWITZER, MEDIUM, TOWED:
155-MM, M198
(1025-01-026-6648)

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA form 2028 (Recommended Changes to Publications and Blank Forms) and mail the form direct to Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAS, Rock Island, IL 61299-6000. A reply will be furnished to you.

Page

HOW TO USE THIS MANUAL iii

CHAPTER 1 INTRODUCTION

Section I General Information 1-1

Section II Equipment Description 1-7

Section III Section Drill 1-15

CHAPTER 2 OPERATING INSTRUCTIONS

Section I Description and Use of Operator's Controls and Indicators 2-1

Section II Preventive Maintenance Checks and Services (PMCS) 2-12

Section III Operation Under Usual Conditions 2-53

Section IV Operation Under Unusual Conditions 2-114

CHAPTER 3 MAINTENANCE INSTRUCTIONS

Section I Lubrication Instructions 3-1

Section II Troubleshooting 3-14

Page

Section III Maintenance Procedures 3-31
Section IV Maintenance of Auxiliary Equipment 3-76
Section V Fire Control Alinement Tests and Measurements 3-78

CHAPTER 4 AMMUNITION

Section I General 4-1
Section II Preparation for Firing 4-21
Section III Misfire and Checkfire Procedures 4-39
Section IV Maintenance 4-45
Section V M712 HEAT, Cannon-Launched, Guided Projectile (Copperhead) and M823 Training Projectile (Copperhead) 4-50

CHAPTER 5 FOREIGN AMMUNITION (NATO) 5-1

CHAPTER 6 DEMOLITION OF MATERIEL TO PREVENT ENEMY USE 6-1

APPENDIX A REFERENCES A-1

APPENDIX B COMPONENTS OF END ITEM LIST

Section I Introduction B-1
Section II Integral Components of End Item B-2
Section III Basic Issue Items B-4

APPENDIX C ADDITIONAL AUTHORIZATION LIST

Section I Introduction C-1
Section II Additional Authorization List C-1

APPENDIX D EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I Introduction D-1
Section II Expendable/Durable Supplies and Materials List D-2

APPENDIX E STOWAGE AND SIGN GUIDE FOR COMPONENTS OF END ITEM, BASIC ISSUE ITEMS, AND APPLICABLE ADDITIONAL AUTHORIZATION LIST ITEMS E-1

ALPHABETICAL INDEX .... Index 1

HOW TO USE THIS MANUAL

GENERAL

In order for you to use this manual efficiently, there are several things you need to know.

a. Whenever the masculine gender (i.e., crewman) is used in this manual, it is intended to include both masculine and feminine genders.

b. References in this manual are to pages or to other publications.

c. Throughout this manual, the text is keyed to the illustrations by use of numbered callouts or color. When more than one item is called out in a procedure, a number in parentheses in the text corresponds with a circled number on the illustration. When only one item is called out, that item is highlighted in red.

d. Except for the locator illustration on page 1-10, the howitzer is shown with the equilibrator ballistic shields and the recoil mechanism ballistic shield removed for clarity.

e. Mission capable criteria is included in the preventive maintenance checks and services table (p 2-13). The information normally found in the For readiness reporting... column is in the Procedures column. Arrows are provided to indicate conditions affecting readiness.

f. The asterisk (*) preceding certain topics throughout the text denotes procedures standardized under the Department of the Army Standardization Program.

This manual is organized to help you quickly find the information you need. There are several useful indexes.

a. Front Cover Index. This is a margin index of often used portions of the manual. To use, bend manual in half and follow the black marker on the front cover to the black marker on the page.

b. Table of Contents. The table of contents (p i) lists all chapters, sections, appendixes, and alphabetical index in order and gives page references to where they begin.

c. Symptom Index. The symptom index (p 3-15) can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order with a page reference to the troubleshooting table (p 3-16) where a test or inspection and corrective action are provided.

d. Alphabetical Index. This index, located at the back of the book (p Index 1), is an extensive subject index for the entire manual. The page numbers following each entry tell you where in the manual to find a particular subject.

This manual has two lists which will help you understand the use of nomenclature and uncommon abbreviations.

a. Nomenclature Cross-Reference List. Throughout this manual, most items are referred to by their official nomenclature. On page 1-1, the items referred to by their common names are listed alphabetically, followed by their official nomenclature.

b. List of Abbreviations. On page 1-5, the alphabetical list gives definitions for the uncommon abbreviations used in this manual.

CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE

This manual provides information for the howitzer crew's field use, operation, maintenance, and training for the M198 155-mm medium towed howitzer.

1-2. MAINTENANCE FORMS AND RECORDS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS), as contained in Maintenance Management Update.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR'S)

EIR's can and must be submitted by anyone who is aware of an unsatisfactory condition with the weapon design or use procedures. It is not necessary to show a new design or list a better way to perform a procedure; just simply tell why the design is unfavorable or why a procedure is difficult. EIR's may be submitted on Standard Form 368 (Product Quality Deficiency Report). Mail directly to Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-QAD, Rock Island, IL 61299-6000. A reply will be furnished to you.

1-4. NOMENCLATURE CROSS REFERENCE

Throughout this manual, most items are referred to by their official nomenclature. The items referred to by their common names are listed below, followed by their official nomenclature.

NOMENCLATURE CROSS-REFERENCE LIST

Common Name	Official Nomenclature
Actuator cylinder assembly	Cylinder assembly (12008010)
Adjusting screw	Screw, shoulder
Aiming post	Post, aiming, M1A2
Aiming post cover	Cover, aiming post, M401
Azimuth counter	Counter, rotating (11741118-1)
Azimuth counter door	Cover assembly (11741163)
Azimuth knob	Knob assembly (8587348)
Azimuth knob bar	Knob (8587442)

NOMENCLATURE CROSS-REFERENCE LIST—Continued

Common Name	Official Nomenclature
Ball	Ball, detent assembly
Band clamp	Clamp, hose
Bearing cover plate	Cover, access
Bell rammer	Rammer, artillery
Bellows	Bellows, rubber
Bottom carriage	Bottom carriage assembly
Brake	Brake assembly, manual
Brake	Brake head assembly
Breechblock handle	Handle
Cannon	Cannon, 155-mm, howitzer, M199
Cap	Cap, protective dust
Carriage	Carriage, M39
Carrying case	Case, carrying (11746386)
Check valve	Valve, pneumatic
Cheesecloth	Cloth, cheesecloth
Collimator	Collimator, infinity aiming reference, M1A1
Correction counter	Counter, rotating (11741119-2 or 11748021)
Counter window	Window, optical instrument
Cover	Support, optical instrument (11727822)
Crocus cloth	Cloth, abrasive
Cross level control knob	Knob (11727885)
Cross level vial	Vial, level, M171 (11729512)
Cross level vial	Cross level vial assembly, M18 (11729551)
Cup	Cup, hammer guide
Cup spring	Spring, helical, compression
Deflection clutch	Knob (11741146)
Deflection counter	Counter, rotating (11741118-2)
Dipstick	Gage rod-cap, liquid
Dummy coupling	Coupling
Elevating handwheel	Handwheel
Elevation adjusting screw	Worm shaft (10554687)
Elevation control knob	Knob assembly (11729580)
Elevation correction counter	Counter, rotating (11748021)
Elevation correction knob	Knob assembly, correction
Elevation counter	Counter, rotating (11729591)
Elevation knob	Knob, shouldered (8626195)
Elevation level vial	Level assembly, fire control M17/M18 (10554827)
Emergency air line coupling	Coupling, half, quick
Emergency reserve air tank	Tank, pressure
Equilibrator	Equilibrator assembly
Equilibrator adjusting screw	Screw, shoulder
Equilibrator rod	Rod, piston, linear actuating
Eyepiece	Eyeshield, optical instrument
Firing base ball	Ball, detent assembly
Firing baseplate	Baseplate, firing assembly

NOMENCLATURE CROSS-REFERENCE LIST—Continued

Common Name	Official Nomenclature
Firing hammer	Hammer, firing, cannon
Firing mechanism	Firing mechanism assembly
Firing mechanism housing assembly	Housing assembly
Firing pin retainer	Pin, lock
Foam square	Cushioning material
Follower	Follower, case assy
Front yoke assembly	Yoke assembly, recoil
Gunner's aid knob	Knob assembly (11741165)
Gunner's quadrant	Quadrant, fire control, gunner's, M1A2
Hammer	Hammer, firing, cannon
Hand grease gun	Lubricating gun, hand
Handbrake	Brake assembly, manual
Handbrake socket	Adapter, hydraulic
Hinge bolt	Bolt, body, internally relieved
Hose assemblies	Hose assembly, emergency or service
Howitzer	Howitzer, medium, towed, 155-mm, M198
Hydraulic pump	Pump, hydraulic, ram
Lacquer	Lacquer, acrylic
Lanyard	Lanyard, firing
Latch assembly	Latch set, optical instrument
Lens	Lens, optical instrument
Lens-cleaning compound	Cleaning compound, optical lens
Lifting eye	Clevis assembly
Loading tray	Tray, loading, ammunition
Locking latch	Latch, optical instrument
Locking pin	Lever, plunger release (11741196)
Locking plug	Plug, tapered
Lock-release lever	Locking assembly
Lunette	Coupler, drawbar, ring
M1A1 collimator	Collimator, infinity aiming reference, M1A1
M18 fuze-setter wrench	Wrench, fuze-setter, combination, M18
M198	Howitzer, medium, towed, 155-mm, M198
M198 howitzer	Howitzer, medium, towed, 155-mm, M198
M199 cannon	Cannon, 155-mm, howitzer, M199
M45 recoil mechanism	Recoil mechanism, 155-mm howitzer, M45
Mount cover	Cover, fire control
Objective lens	Window, optical instrument (8626291)
Obturator spindle assembly	Spindle assembly
Oil reserve indicator	Pressure indicator
Pantel	Telescope, panoramic, M137
Parallax shield	Cover assembly (11741126)
Piece	Howitzer, medium, towed, 155-mm, M198
Pitch level control knob	Knob (11727885)
Pitch level vial	Vial, level (11729512)

NOMENCLATURE CROSS-REFERENCE LIST—Continued

Common Name	Official Nomenclature
Polyurethane foam	Cushioning material
Pump handle	Tube, metallic
Rag	Rag, wiping
Rammer staff	Staff section
Recoil mechanism	Recoil mechanism, M45
Recoil mechanism guide	Guide assembly
Recoil rail	Rail, recoil mechanism
Retaining pin	Pin, lock
Rifle bore cleaner	Cleaning compound
Rubber seal	Packing, preformed
Scale	Plate, designation
Sear pin	Pin, grooved, headless
Service air line coupling	Coupling, half, quick
Sight unit case	Case, carrying (10549222)
Sledge hammer	Hammer, hand
Soap	Soap, toilet
Socket	Adapter, hydraulic
Spade	Spade, gun carriage
Spade hinge pin	Pin, shoulder, headed
Spade key	Key, machine
Spade retaining pin	Pin, quick release
Speed shift assembly	Cylinder assembly (12008460)
Spring	Spring, firing pin
Telescope and mount cover	Cover, fire control (11729566)
Thermal warning device indicator	Pointer, dial: thermal warning device
Top carriage	Top carriage assembly
Trail retaining pin	Pin, spring
Trail retaining plug	Plug
Travel lock pin	Pin assembly
Traversing handwheel	Handwheel
Traversing stop	Arm
Tube	Tube, cannon
Weapon	Howitzer, medium, towed, 155-mm, M198
Wheel	Tire
Wheel bearing	Bearing, roller, tapered
Wheel nuts	Nut, plain, single ball seat
Wing nuts	Thumbscrews (11727842-1 and 11727842-2)
Yoke	Yoke, hammer guide
Yoke spring	Spring, helical, compression

1-5. LIST OF ABBREVIATIONS

The following alphabetical list gives definitions for the uncommon abbreviations used in this manual.

LIST OF ABBREVIATIONS

Abbreviation	Definition
ADAM	Area denial artillery munition
BCS	Battery computer system
BE	Base-ejection
CHG	Charge

LIST OF ABBREVIATIONS—Continued

Abbreviation	Definition
CLGP	Cannon-launched, guided projectile
comp	Composition
CP	Concrete-piercing
CTA	Common table of allowances
DF	Deflection
EOD	Explosive ordnance disposal
FZ	Fuze
GB	Green bag
GB	Nonpersistent toxic nerve gas
H	Mustard gas
HC	White chemical smoke mixture
HD	Distilled mustard gas
HE	High-explosive
HEAT	High-explosive, anti-tank
HERA	High-explosive, rocket-assisted
ICM	Improved conventional munitions
JTA	Joint table of allowance
MT	Mechanical time
MTOE	Modified tables of organization and equipment
MTSQ	Mechanical time and superquick
N-m	Newton meters
PD	Point-detonating
prop	Propelling
prox	Proximity
QE	Quadrant elevation
RAAMS	Remote anti-armor mine system
RMK	Remarks
RPO	Radiological protection officer
SOP	Standing operation procedure
SQ	Superquick
suppl	Supplementary
TDA	Tables of distribution and allowances
TI	Time
TOE	Tables of organization and equipment
TWD	Thermal warning device
VT	Variable time
VX	Persistent toxic nerve gas
WB	White bag
WP	White phosphorous
wpn	Weapon
WTR*	Grease, aircraft, general purpose, wide temperature range

---

*Throughout this manual GPG may be shown as the symbol for the above listed lubricant. However, the correct military symbol is WTR, and is listed as such in LO 9-1025-211-13.

1-6. DEFINITIONS OF TERMS

The following is an alphabetical listing of terms with definitions used in this manual. These terms need explanation and are not defined within the text.

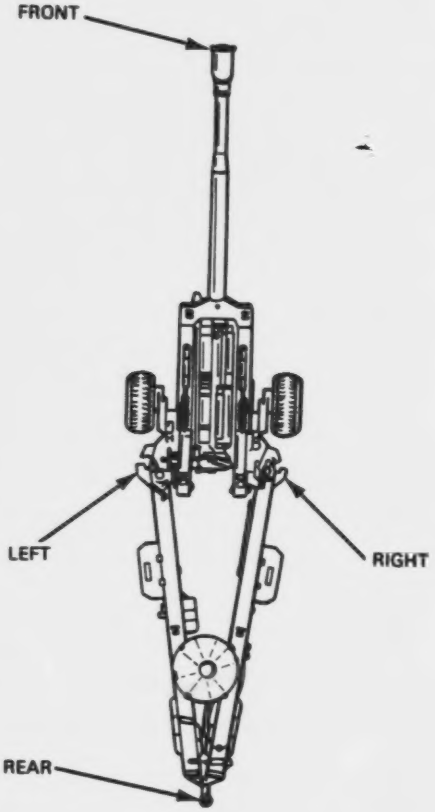
a. Front of Weapon. The muzzle end of the howitzer.

b. Howitzer Section. Those personnel specified by the current table of organization and equipment that make up a howitzer section.

c. Left Side of Weapon. At a person's left-hand side when standing at the breech end of the weapon, facing toward the cannon muzzle.

d. Rear of Weapon. The breech end of the howitzer.

e. Right Side of Weapon. At a person's right-hand side when standing at the breech end of the weapon, facing toward the cannon muzzle.



1-7. HAND RECEIPT

Hand receipts for components of end item (COEI), basic issue items (BII), and additional authorization list (AAL) items are in TM 9-1025-211-10-HR. This manual is to aid in property accountability and is available through: Commander, AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220-2896.

1-7.1 CORROSION PREVENTION AND CONTROL

Corrosion prevention and control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using Standard Form 368, Quality Deficiency Report. Use of key words such as ''corrosion,'' ''rust,'' ''deterioration,'' or ''cracking'' will assure that the information is identified as a CPC problem. Submit the form to: Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-QAD/Customer Feedback Center, Rock Island, IL 61299-6000.

Section II. EQUIPMENT DESCRIPTION

1-8. EQUIPMENT PURPOSE, CAPABILITIES, AND FEATURES

a. The purpose of the M198 howitzer is to provide general support field artillery firing for the light divisions by providing both nuclear and nonnuclear firing.

b. The M198 is an extended-range, split-trail weapon that can be towed by a vehicle or airlifted by a CH47 helicopter. The carriage has a retractable suspension system and a top carriage which can be rotated 3200 mils to decrease overall length for shipment or storage.

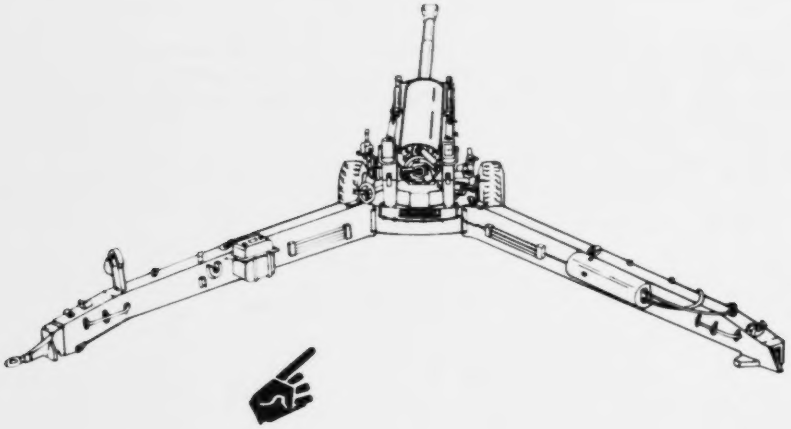
c. The fire control equipment may be used by one or two crewmen for direct or indirect fire. The gunner on the left side controls left and right (traversing) settings and the assistant gunner on the right side controls up and down (elevation) settings. The equipment can also be operated by a gunner on the left side controlling both traversing and elevation settings. All vials, reticles, and counters on the fire control and accessory equipment are radioactively illuminated.

d. The lightweight M198 howitzer has a low profile, may be emplaced rapidly, and has a 6400-mil speed shift assembly.

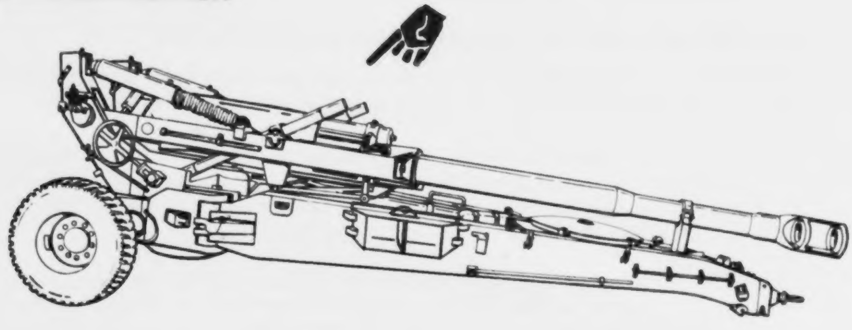
1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

a. The firing, stowed, and towed positions for the M198 howitzer are as shown.

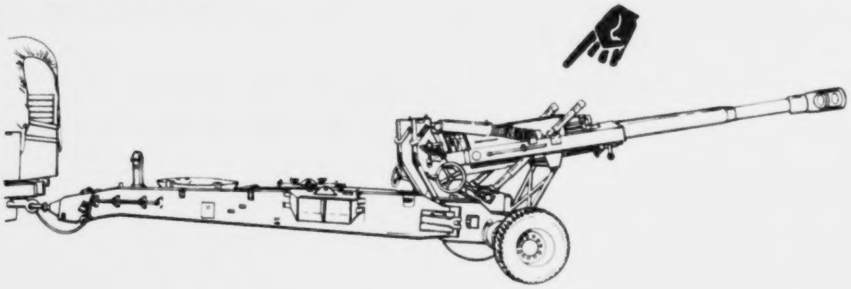
FIRING POSITION



STOWED POSITION



TOWED POSITION

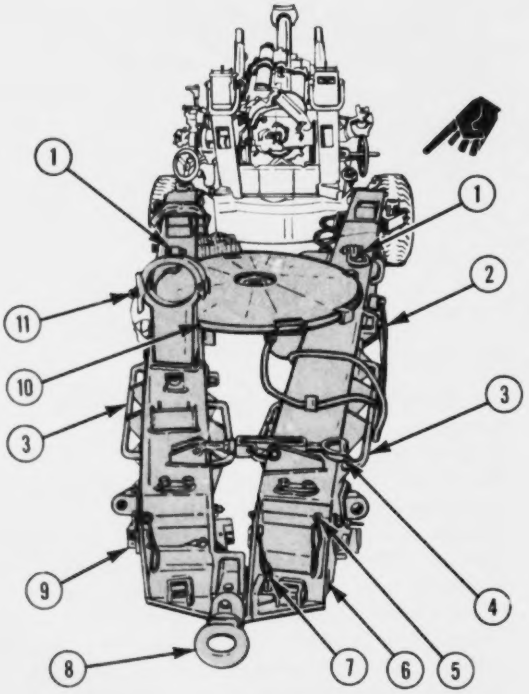


b. Familiarize yourself with the components of the M198 howitzer. Start with item number 1; then go to numbers 2, 3, 4, 5; and continue until you reach number 48. Go to page 2-1 for a detailed description of the controls and indicators.

HOWITZER COMPONENTS

Item	Component
1	Lifting eye
2	Service and emergency hose assemblies
3	Lifting handle
4	Trail lock
5	Spade retaining pin
6	Right trail
7	Trail retaining pin
8	Lunette
9	Left trail
10	Firing baseplate
11	Gun tube travel lock

HOWITZER COMPONENTS—Continued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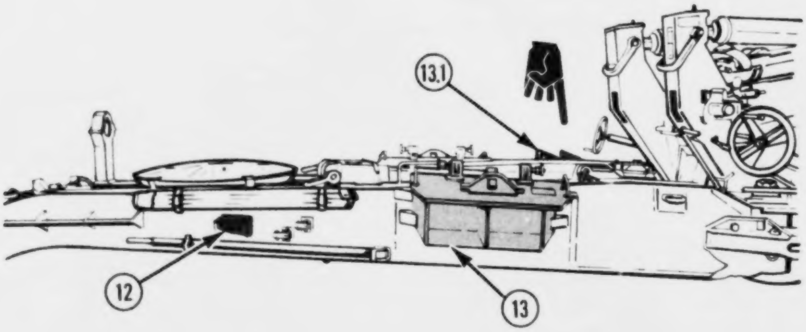
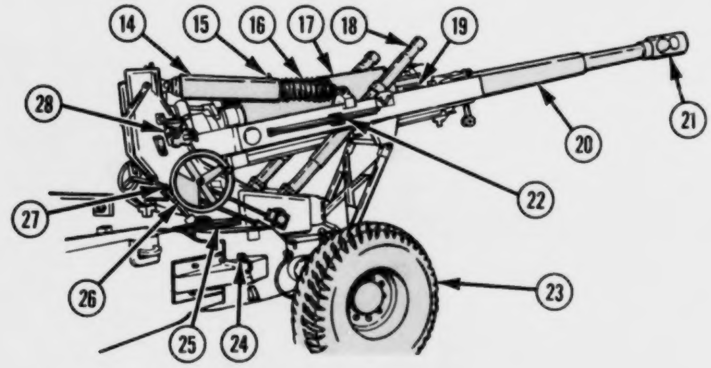


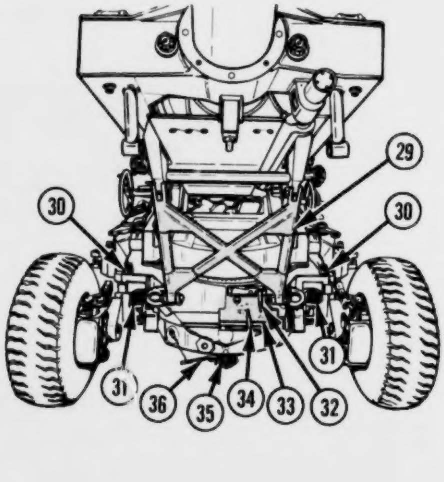
Item	Component
12	Drain cock
13	Spade
13.1	BCS gun assembly GA bracket

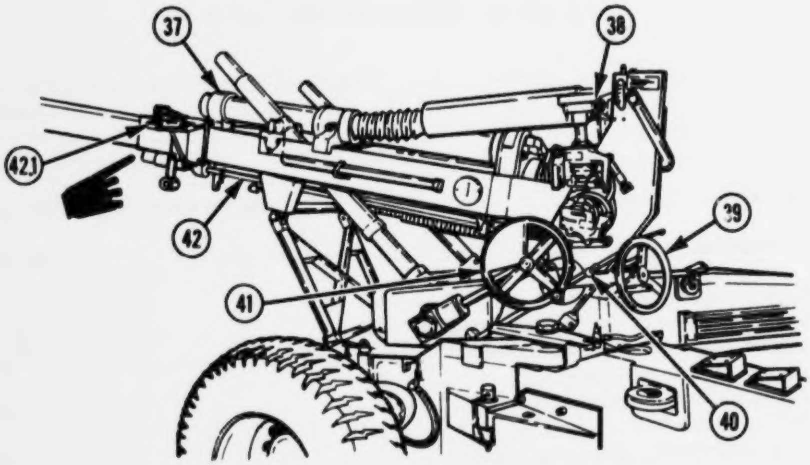
HOWITZER COMPONENTS—Continued



Item	Component
14	Equilibrator ballistic shield (both sides)
15	Equilibrator cylinder (both sides)
16	Bellows (both sides)
17	Recoil mechanism ballistic shield
18	Elevating screw assembly (both sides)
19	Oil reserve indicator
20	Cannon tube
21	Muzzle brake
22	Pump handle (both sides)
23	Wheel (both sides)
24	Locking plug (both sides)
25	Traverse stop (both sides)
26	Elevating handwheel (both sides)
27	Manual control lever (both sides)
28	M172 telescope and quadrant mount

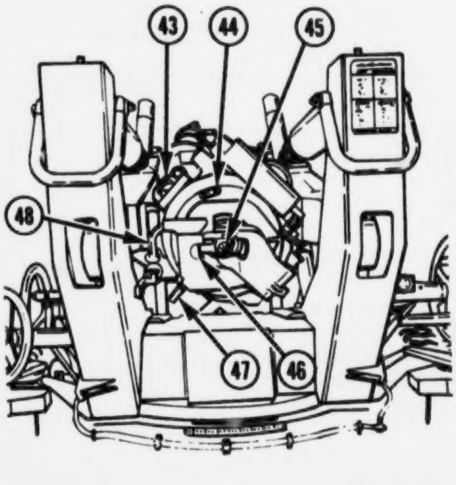
Item	Component
29	Travel lock assembly
30	Wheel lock handle
31	Hydraulic adapter
32	WHEELS lever
33	Manifold assembly
34	SPEEDSHIFT lever
35	Ball
36	Lock-release lever





Item	Component
37	Recoil mechanism
38	M171 telescope and quadrant mount
39	Traversing handwheel
40	Manual control lever (both sides)
41	Elevating handwheel (both sides)
42	Variable recoil shaft
42.1	M90 chronograph antenna mounting bracket

Item	Component
43	Thermal warning device
44	Cam
45	Firing mechanism
46	Firing mechanism block assembly
47	Breechblock lever
48	Breechblock handle



1-10. PERFORMANCE DATA

HOWITZER PERFORMANCE DATA

Brakes:	
Parking	Manually operated disk
Service	Air/oil power disk
Breech life	Original and five tubes
Breech type	Screw block, interrupted thread
Center of gravity	Not applicable
Dimensions (travel conditions):	
Ground clearance at ball of firing baseplate	13 in. (0.33 m)
Height at muzzle brake (towed position)	9 ft 6 in. (2.89 m)
Length:	
Firing position (without spades)	36 ft 2 in. (11.02 m)
Stowed position	24 ft 5 in. (7.44 m)
Towed position	40 ft 6 in. (12.34 m)
Tread (center-to-center)	7 ft 9 in. (2.36 m)
Width (towed position)	9 ft 2 in. (2.79 m)
EFC rating	TM 9-1000-202-14
Handwheel load:	
Elevating	180 in.-lb (20.37 N-m)
Traversing	120 in.-lb (13.50 N-m)
Length of recoil (zone 8 (M203)):	
Min to 500 mils	65 in. ± 6 (165.10 cm ± 15.24)
501 to 800 mils	56 in. ± 7 (142.24 cm ± 17.78)
801 to max mils	50 in. ± 2 (127.0 cm ± 5.08)
Lunette load (30 in. (76.20 cm)):	
Stowed position	3500 lb (1587.60 kg)
Towed position	500 lb (226.80 kg)
Maximum ranges	30,000 m (32,808 yd) w/M203 propelling charge, charge 8 (w/RAP rd, M549A1) 5000 to 9900 m (5468.1 to 10826.8 yd) w/M3 propelling charge using charges 2 thru 5
Maximum terrain slope	10-degree cant
Maximum towing speed:	
Cross country	15 mph (8.04 km/hr)
Improved roads	45 mph (72.40 km/hr)
Secondary roads	30 mph (48.27 km/hr)

HOWITZER PERFORMANCE DATA—Continued

Mils of movement per turn of handwheel:	
Elevating	10 mils
Traversing	10 mils
Muzzle brake	Double baffle
On-carriage elevating range	-75 to + 1275 mils
Primer mover	5-ton (4536-kg) truck
Rate of fire	4 rounds/minute—maximum, 2 rounds/minute—sustained or as determined by thermal warning device
Recoil mechanism	Hydropneumatic, variable, dependent
Speed shift range	6400 mils
Tires (narrow):	
Pressure	100-105 psi (7-7.35 kg/cm²)
Size	10.00 x 20.00, 14 ply
Tires (radial)	
Pressure	110 psi (7.73 kg/cm²)
Size	11.0 x 20.00, 16 ply
Tires (wide):	
Pressure	45 psi (3.16 kg/cm²)
Size	16.5 to 19.5, 16 ply
Traversing range	400 mils left and 400 mils right of center
Tube life	Based on wear factor (pullover gage reading) (Refer to TM 9-1000-202-14.)
Weight (including basic issue items)	15,750 lb (7087.5 kg)

FIRE CONTROL EQUIPMENT PERFORMANCE DATA

M17 Fire Control Quadrant:	
Correction	±95 mils
Elevation	−280 to +1433 mils
Least increment reading (counters)	1 mil
Radioactive material:	
Max surface radiation	0 millirad per hour
Tritium H_3	1.86 curies
Weight	7.50 lb (3.40 kg)

FIRE CONTROL EQUIPMENT PERFORMANCE DATA—Continued

M18 Fire Control Quadrant:

Correction	± 95 mils
Elevation	−280 to +1433 mils
Least increment reading (counters)	1 mil
Radioactive material:	
Max surface radiation	0 millirad per hour
Tritium H_3	1.95 curies
Weight	7.50 lb (3.40 kg)

M171 Telescope and Quadrant Mount:

Cross level adjustment:	
Left	178 mils
Right	178 mils
Elevation	−270 to +1333 mils
Pitch level adjustment:	
Aft	178 mils
Fore	178 mils
Radioactive material:	
Max surface radiation	0 millirad per hour
Tritium H_3	0.15 curies
Weight:	
Adapter assembly	3.25 lb (1.47 kg)
Mount	75 lb (34.02 kg)
Optical instrument support	2 lb (0.91 kg)

M172 Telescope and Quadrant Mount:

Boresighting:	
Azimuth	± 18 mils
Elevation	± 15 mils
Cross level adjustment	± 34 degrees
Weight:	
Adapter assembly	4.75 lb (2.15 kg)
Mount	27.50 lb (12.47 kg)

M137 Panoramic Telescope:

Field of view	10 degrees
Movement:	
Azimuth counter	6400 mils*
Azimuth (deflection)	6400 mils
Correction (AZ)	± 95 mils
Elevation	± 300 mils
Least increment reading (AZ)	0.25 mil
Power	4 X
Radioactive material:	
Max surface radiation	0 millirad per hour
Tritium H_3	5.10 curies
Weight	19 lb (8.62 kg)

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*Increasing clockwise.

FIRE CONTROL EQUIPMENT PERFORMANCE DATA—Continued

M138 Elbow Telescope:

Elevation	60 mils
Field of view	8 degrees
Power	8 X
Radioactive material:	
Tritium H_3	4.4 curies
Max surface radiation	0 millirad per hour
Weight	8 lb (3.63 kg)

AUXILIARY EQUIPMENT PERFORMANCE DATA

M139 Alinement Device:

Radioactive material:	
Max surface radiation	0 millirad per hour
Tritium H_3	3 curies
Weight	1.60 lb (0.73 kg)

Section III. SECTION DRILL

1-11. GENERAL

The purpose of section drill is to improve the howitzer section through execution of assigned tasks and cross-training of section personnel.

1-12. INSTRUCTIONS

a. Section drill must be conducted in silence, except for commands and reports. The section must be drilled until reaction to commands is quick, automatic, and correct.

b. Battery officers will supervise the drill. Errors will be corrected immediately.

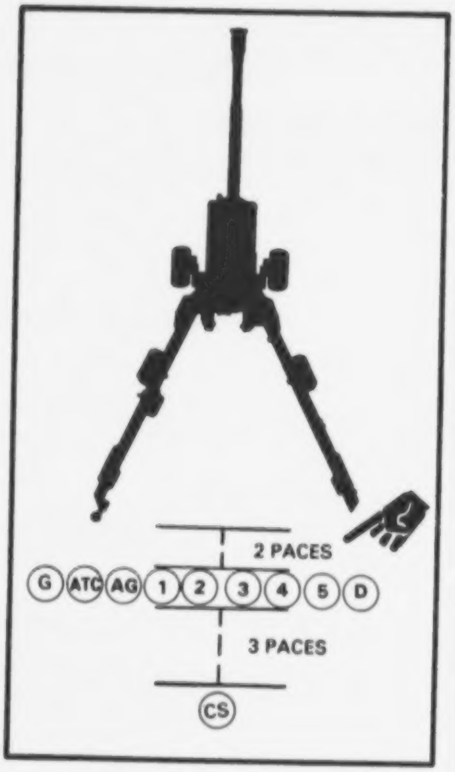
c. Duties should be rotated during training so that each crewman of the section can perform all duties within the section. Battery overhead personnel should also take part in section drill so that they can perform with a howitzer section, if required.

d. If the number of available personnel falls below the standard 10-man crew, the reduced crew drill (p 1-20) will be used.

1-13. PRELIMINARY COMMANDS AND FORMATIONS TO FORM THE SECTION

a. **To Fall In.** The chief of section takes his assigned post. The preparatory command may indicate the place and direction in which the section is to form. At the first formation for a drill or exercise, the caution, HOWITZER SECTION, precedes the command. The commands are FALL IN or 1. IN FRONT (REAR) OF YOUR PIECE, 2. FALL IN.

EXECUTION OF COMMAND TO FALL IN



NOTE

The formation for IN REAR OF YOUR PIECE is illustrated.

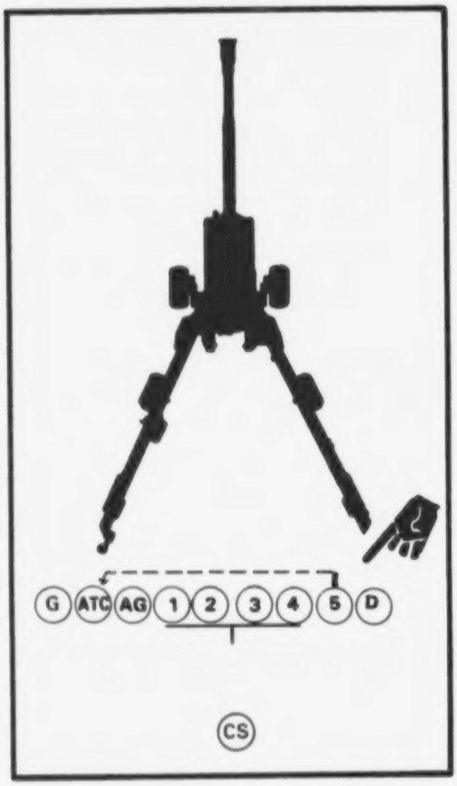
At the command, the section moves at double time and forms a single rank, at close intervals, guiding on the gunner. The numbered cannoneers should be in order between the assistant gunner and the driver of the prime mover. The section stands at attention, centered on and facing the chief of section at a distance of three paces.

b. To Change Posts.

(1) To have the assistant gunner and numbered cannoneers change posts, the command is 1. CHANGE POSTS, 2. MARCH.

EXECUTION OF COMMAND TO CHANGE POSTS

At the command, the assistant gunner and numbered cannoneers, except for cannoneer no. 5, take two steps left, taking the position of the next higher numbered cannoneer. At the same time, cannoneer no. 5 moves at double time to the rear of the rank to the post of the ammunition team chief. All other crewmen stand fast.



(2) To have the entire section change posts, the command is 1. SECTION CHANGE POSTS, 2. MARCH.

EXECUTION OF COMMAND TO CHANGE POSTS (ENTIRE SECTION)

At the command, all crewmen of the section take two steps left, except for the crewman at the extreme left. That crewman moves at double time to the rear of the rank and takes the post of the gunner.

c. **To Call Off.** The command is CALL OFF.

EXECUTION OF COMMAND TO CALL OFF

1 All crewmen in rank, except the gunner, execute eyes right.

2 The section calls off in sequence, GUNNER, AMMUNITION TEAM CHIEF, ASSISTANT GUNNER, 1, 2, 3, 4, 5, DRIVER. Each crewman calls out and turns head smartly to the front.

d. To Mount. To mount, the commands are MOUNT or 1. PREPARE TO MOUNT, 2. MOUNT. If any crewmen of the section are to remain dismounted, their designations are announced with the caution, STAND FAST, given between the preparatory command and the command of execution; for example, 1. PREPARE TO MOUNT; DRIVER STAND FAST, 2. MOUNT.

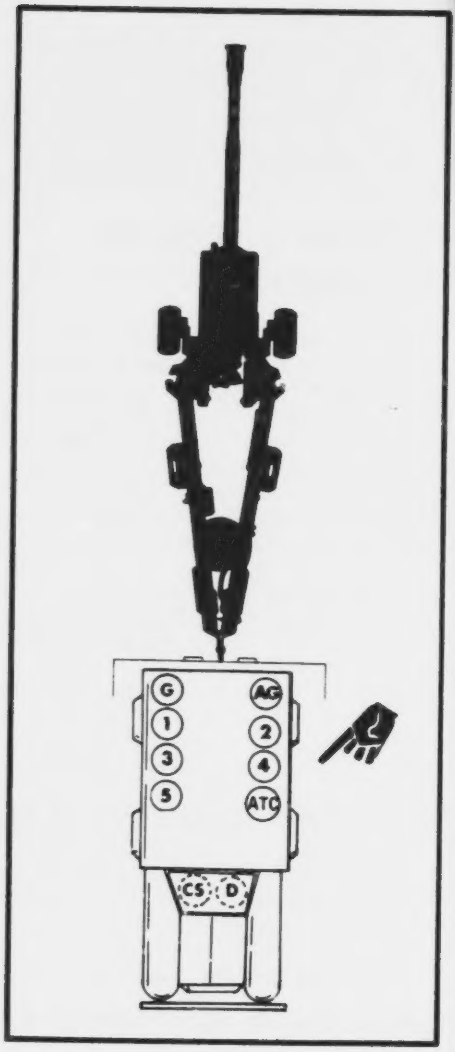
EXECUTION OF COMMAND TO MOUNT

1 At the command, MOUNT, the section crewmen take positions as shown.

2 At the command of execution, the driver and chief of section take their positions at the rear of the prime mover, on the left and right, respectively, where they can observe and assist in loading.

3 The two columns mount in order from front to rear and take seats as shown. Each cannoneer is assisted in mounting by the person directly behind (or in front in the case of the last cannoneer in column) to ensure promptness and prevent injuries.

4 Before mounting, the chief of section and driver check that the howitzer is properly coupled, the personnel and equipment are aboard, and the tailgate and safety straps are secure.



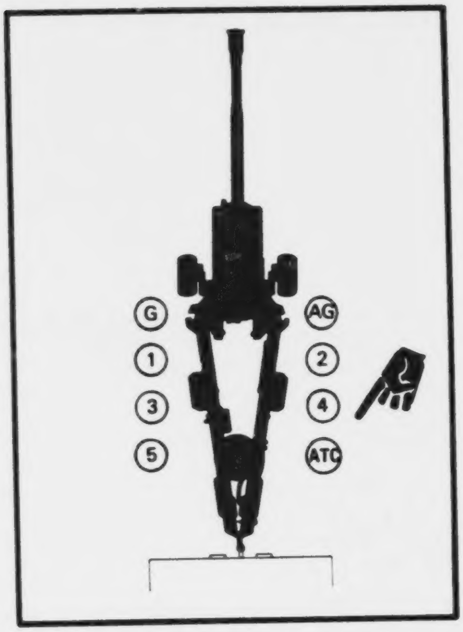
e. To Dismount. The commands are DISMOUNT or 1. PREPARE TO DISMOUNT, 2. DISMOUNT.

EXECUTION OF COMMAND TO DISMOUNT

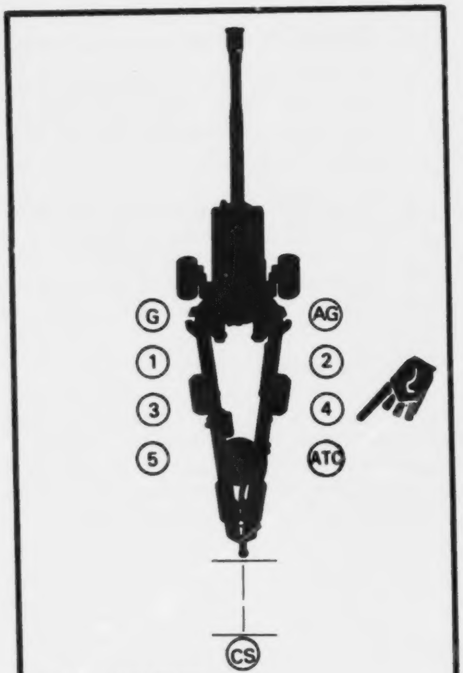
1 At the preparatory command, the personnel in the prime mover unlatch and open the tailgate of the prime mover.

2 All crewmen of the section assume positions from which they can dismount properly.

3 At the command of execution, they dismount and, at double time, take the posts shown.



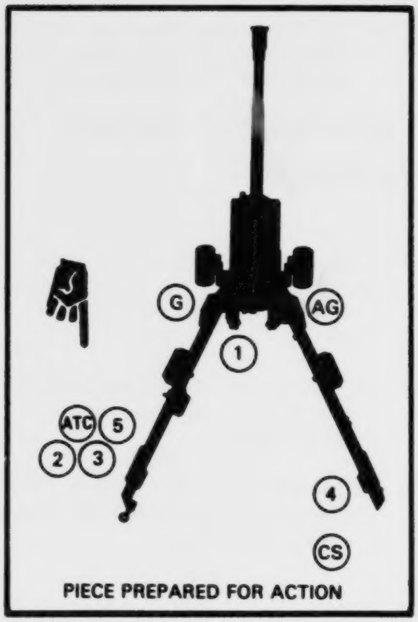
f. To Post. The command is 1. CANNONEERS, 2. POSTS. This general command is applicable whether the section is in or out of ranks, at a halt, or marching.



PIECE UNCOUPLED,
NOT PREPARED FOR ACTION

EXECUTION OF COMMAND TO POST

At the command, the section moves at double time and takes the positions shown. The section then stands at attention.



PIECE PREPARED FOR ACTION

1-14. BREAK PERIODS DURING TRAINING OR FIRING

a. **At Drill.** When it is desired to give the personnel a rest from drill or to relieve them temporarily from formation or posts, the command, FALL OUT, is given. The command may be given at any time and means that the section is to remain in the drill area.

b. **When Firing.** When firing has been suspended temporarily, but the section is to remain in the vicinity of the prime mover, the command, FALL OUT, is given. Crewmen stand clear of the howitzer so that settings remain undisturbed. During these periods, the chief of section may direct the crewmen to improve their position, to replenish ammunition, or to do other necessary work.

*1-15. REDUCED CREW DRILL

It is normal to expect gun crews to be reduced to less than the prescribed TOE strength due to illness, casualties, battery taskings, and the need to rest personnel. To meet the need of these occasions and the need to maintain operations of the section in as orderly a manner as possible, the duties of the individuals of the section have been combined as shown on the next page.

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*Procedures for operating with a reduced crew have been standardized under the Department of the Army Standardization Program.

10-Man	9-Man	8-Man	7-Man
Deleted.	**CS**	**CS**	**CS**
	G	**G**	**G**
	ATC	**ATC**	**ATC**
	AG	**AG**	**AG/1**
	1	**1**	**2**
	2	**2**	**3/5**
	3/5	**3/5**	**4/D**
	4	**4/D**	
	D		

The section chief will assign duties to crew members when the number of available personnel falls below the level shown above.

CHAPTER 2
OPERATING INSTRUCTIONS

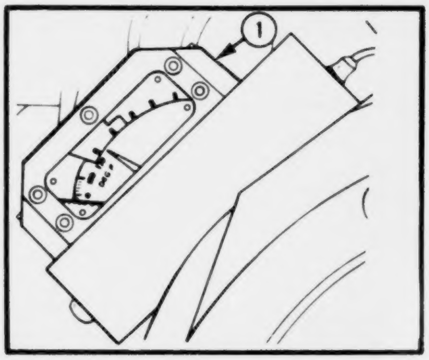
Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. GENERAL

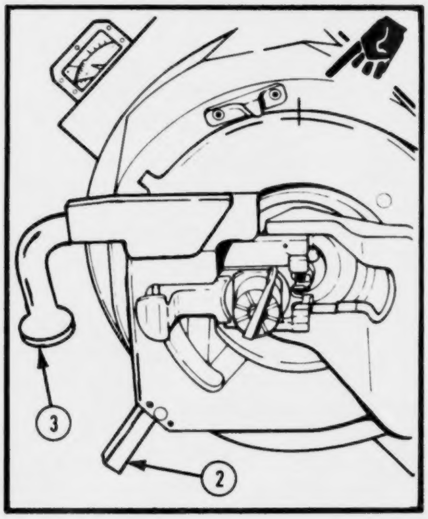
Before attempting to operate the M198 howitzer, make certain you are familiar with the location and operation of all controls and indicators.

CONTROLS AND INDICATORS

CANNON



THERMAL WARNING DEVICE. The thermal warning device (TWD) (1) measures the temperature of the tube in a region just behind the origin of the rifling. Different misfire/checkfire procedures apply depending on whether the indicator points to the green, yellow, or red area of the dial. See page 4-39 for misfire and checkfire procedures.

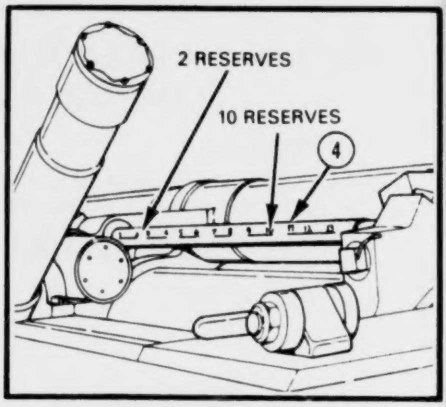


BREECHBLOCK LEVER. The breechblock lever (2) is located on the breechblock assembly and locks the breechblock assembly in place during firing.

BREECHBLOCK HANDLE. The breechblock handle (3) is located on and assists in opening and closing the breechblock assembly. To open the breechblock assembly, lift breechblock lever (2) up, lift handle up until it comes in contact with the cam, and swing the breechblock assembly down.

CONTROLS AND INDICATORS—Continued

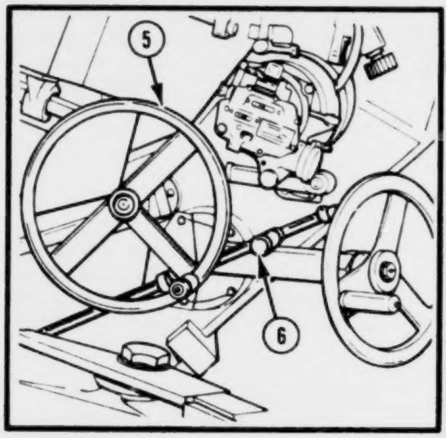
RECOIL MECHANISM



OIL RESERVE INDICATOR. Located on the top center portion of the recoil mechanism, the oil reserve indicator (4) is used before, during, and after firing to show the number of oil reserves in the recoil mechanism. The location of the end of the piston assembly inside the indicator shows, by corresponding number on the indicator, the number of oil reserves.

CARRIAGE

WARNING
Hold elevating handwheel (5) firmly when depressing manual control lever (6) to keep cannon from moving due to over- or underequilibration.



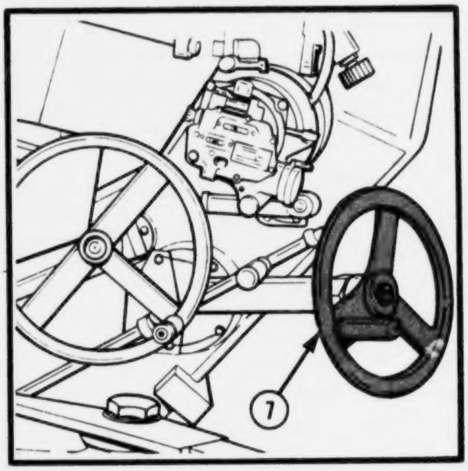
ELEVATING HANDWHEEL. Elevating and depressing the cannon can be controlled from either or both sides of the howitzer by the elevating handwheel (5). To operate the elevating handwheel, the manual control lever (6) must be pushed down. On the gunner's side, turning the handwheel clockwise elevates the cannon; turning handwheel counterclockwise depresses the cannon. On the assistant gunner's side, turning the handwheel clockwise depresses the cannon; turning the handwheel counterclockwise elevates the cannon.

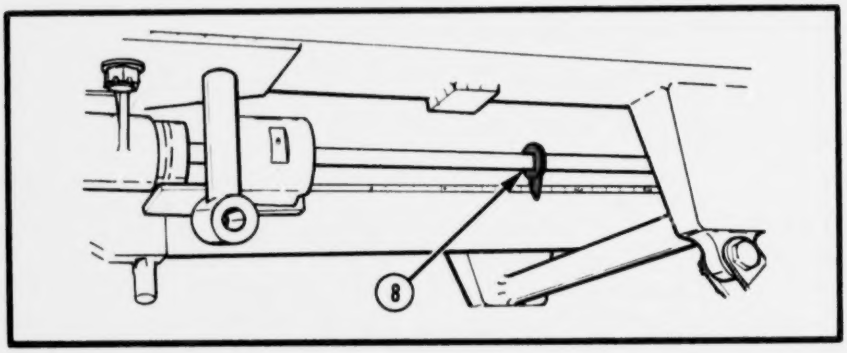
MANUAL CONTROL LEVER. The manual control lever (6) is used to release or secure the cannon. Pushing down the lever allows the cannon to be elevated or depressed; releasing the lever locks the cannon in place.

CONTROLS AND INDICATORS—Continued

ARRIAGE—Continued

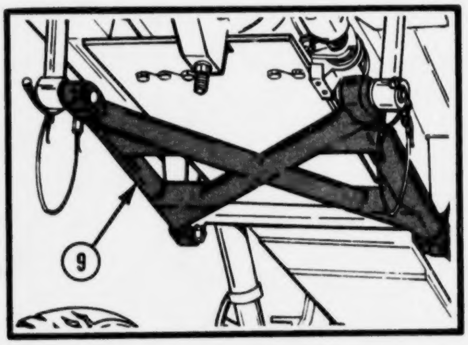
TRAVERSING HANDWHEEL. Located on the left rear side of the top carriage, the traversing handwheel (7) is used to traverse the top carriage during firing operations and to traverse the top carriage into the stowed position over the trails. Turning the handwheel clockwise moves the cannon to the right; turning the handwheel counterclockwise moves the cannon to the left.





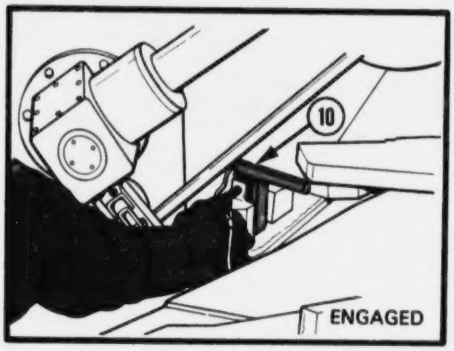
RECOIL INDICATOR POINTER. The recoil indicator pointer (8) is used to measure the length of recoil after firing. To operate, the pointer must be pushed all the way forward (toward the muzzle) on the variable recoil shaft before firing.

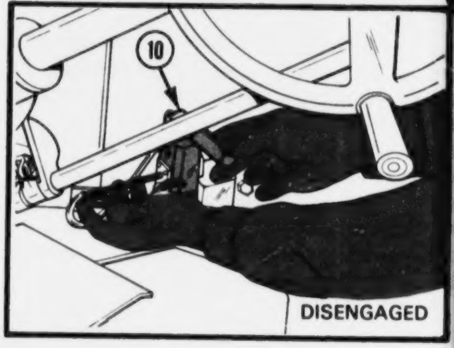
TRAVEL LOCK ASSEMBLY. The travel lock assembly (9) secures the top carriage to the bottom carriage during towing or airlift operations. It is locked to the underside of the cradle assembly when not in use.



CONTROLS AND INDICATORS—Continued

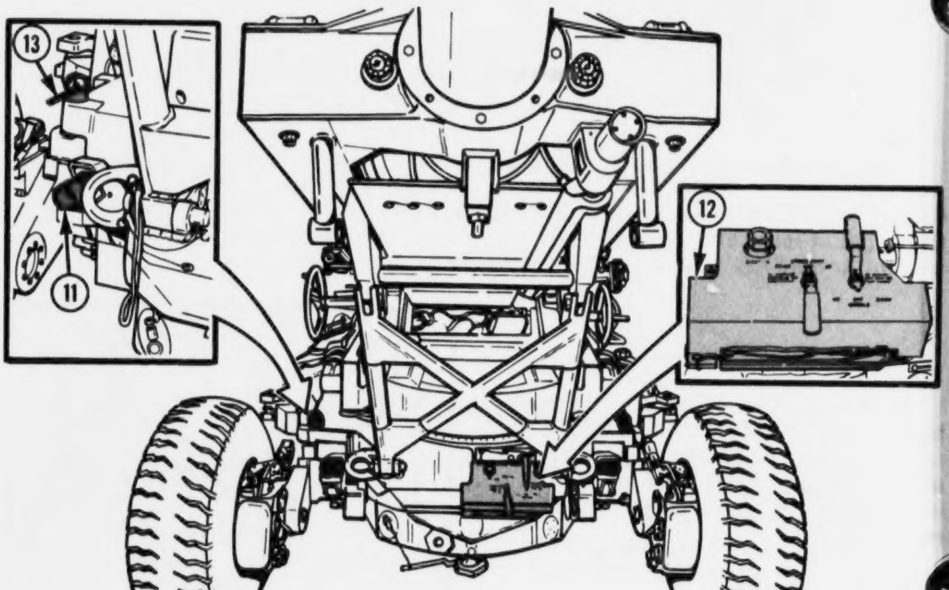
TOP CARRIAGE




10
DISENGAGED

TOP CARRIAGE LOCKING PIN. When the top carriage locking pin (10) is in the down position, the weapon cannot be traversed. A retaining pin holds the locking pin in the desired position.

BOTTOM CARRIAGE



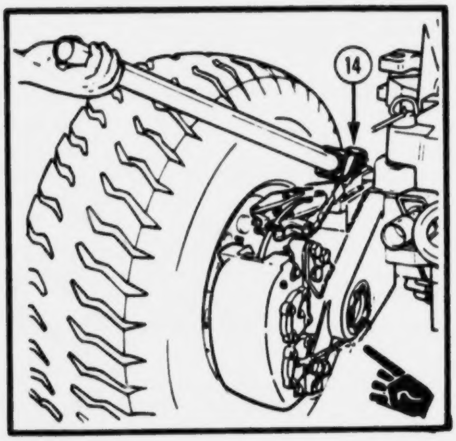
CONTROLS AND INDICATORS—Continued

BOTTOM CARRIAGE—Continued

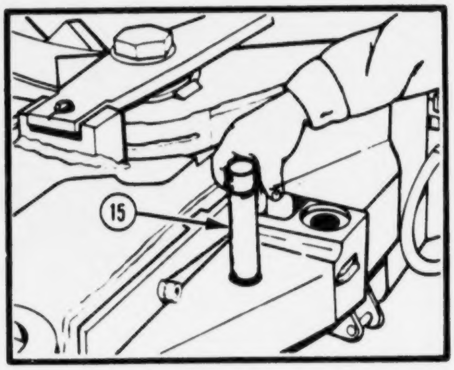
HYDRAULIC PUMPS. The hydraulic pumps (11) can be used separately or together to activate the wheel actuator cylinder assembly and/or the speed shift assembly, depending on the position at which the levers on the manifold assembly are set.

MANIFOLD ASSEMBLY. The manifold assembly (12) contains the controls for the wheel actuator cylinder assembly and the speed shift assembly, plus a dipstick to measure the fluid level. The hydraulic-type wheel actuator cylinder assembly provides a way to raise and lower the wheels and is controlled by pushing the WHEELS lever down and moving it from the OFF position to the UP or DOWN position. The hydraulic speed shift assembly provides a way to rotate the howitzer on its axis 6400 mils. The speed shift assembly is controlled by lifting up the SPEEDSHIFT lever and moving it from the OFF position to the UP or DOWN position.

WHEEL LOCK HANDLE. The wheel lock handle (13) locks the wheel and axle in the towed or firing modes.



HANDBRAKES. There is one handbrake (14) on each wheel. The brakes are engaged by inserting the pump handle in the socket and lifting up. The brakes are used to keep the howitzer from moving.

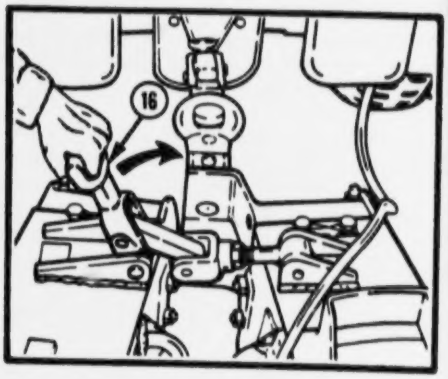


LOCKING PLUGS. There is one locking plug (15) on each trail. The plug is installed in the firing (forward) position to secure the trail during firing. The plug must be removed to close the trail.

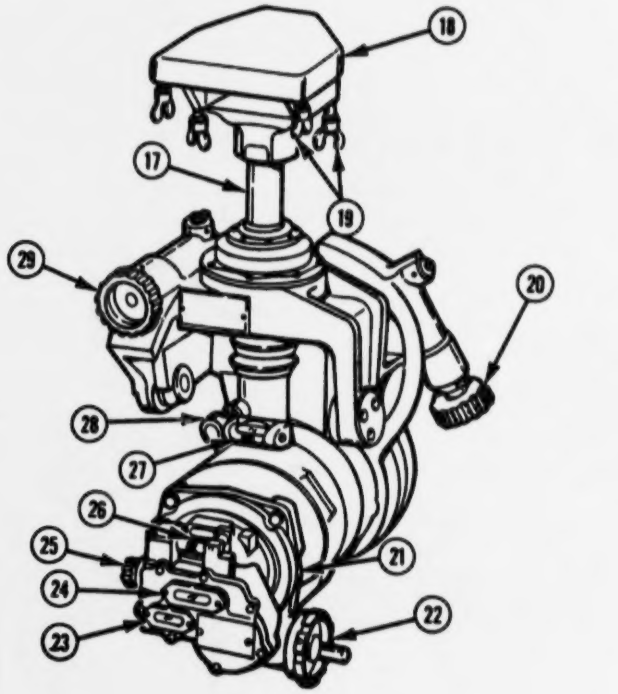
CONTROLS AND INDICATORS—Continued

BOTTOM CARRIAGE—Continued

TRAIL LOCK HANDLE. The trail lock handle (16) is located on the right trail and holds the trails together during movement. To unlock the trails, lift the handle up.



M171 TELESCOPE AND QUADRANT MOUNT AND M17 FIRE CONTROL QUADRANT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CONTROLS AND INDICATORS—Continued

M171 TELESCOPE AND QUADRANT MOUNT AND M17 FIRE CONTROL QUADRANT—Continued

M171 TELESCOPE AND QUADRANT MOUNT. The M171 telescope and quadrant mount (17) provides a mount for the pantel and the M17 fire control quadrant (21).

COVER. The cover (18) protects the surfaces of the M171 telescope and quadrant mount (17).

WING NUTS. The wing nuts (19) hold the pantel to the M171 telescope and quadrant mount (17).

PITCH LEVEL CONTROL KNOB. Turning the pitch level control knob (20) centers the bubble in the pitch level vial (27).

M17 FIRE CONTROL QUADRANT. The M17 fire control quadrant (21) controls the cannon elevation during one-person indirect fire and laying operations.

ELEVATION CONTROL KNOB. Turning the elevation control knob (22) changes the reading in the elevation counter (23).

ELEVATION COUNTER. The elevation counter (23) registers cannon elevation in mils during laying and one-person operations.

ELEVATION CORRECTION COUNTER. The elevation correction counter (24) registers corrections in mils during one-person operations.

ELEVATION CORRECTION KNOB. Turning the elevation correction knob (25) changes the readings in the elevation correction counter (24).

ELEVATION LEVEL VIAL. When the bubble in the elevation level vial (26) is centered, the M17 fire control quadrant (21) is level vertically.

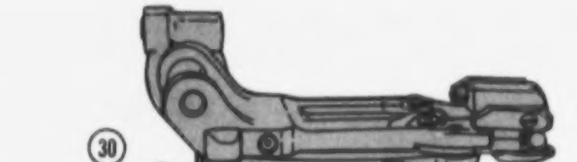
PITCH LEVEL VIAL. When the bubble in the pitch level vial (27) is centered, the M171 telescope and quadrant mount (17) is level vertically.

CROSS LEVEL VIAL. When the bubble in the cross level vial (28) is centered, the M171 telescope and quadrant mount (17) is level horizontally.

CROSS LEVEL CONTROL KNOB. Turning the cross level control knob (29) centers the bubble in the cross level vial (28).

CONTROLS AND INDICATORS—Continued

M172 TELESCOPE AND QUADRANT MOUNT AND M18 FIRE CONTROL QUADRANT



M172 TELESCOPE AND QUADRANT MOUNT. The M172 telescope and quadrant mount (30) provides a mount for the M18 fire control quadrant (37) and the elbow telescope.

ELEVATION CORRECTION KNOB. Turning the elevation correction knob (31) changes the reading in the elevation correction counter (34).

ELEVATION LEVEL VIAL. When the bubble in the elevation level vial (32) is centered, the M18 fire control quadrant (37) is level vertically.

CROSS LEVEL VIAL. When the bubble in the cross level vial (33) is centered, the M18 fire control quadrant (37) is level horizontally.

ELEVATION CORRECTION COUNTER. The elevation correction counter (34) registers elevation corrections in mils.

ELEVATION CONTROL KNOB. The elevation control knob (35) changes the readings in the elevation counter (36).

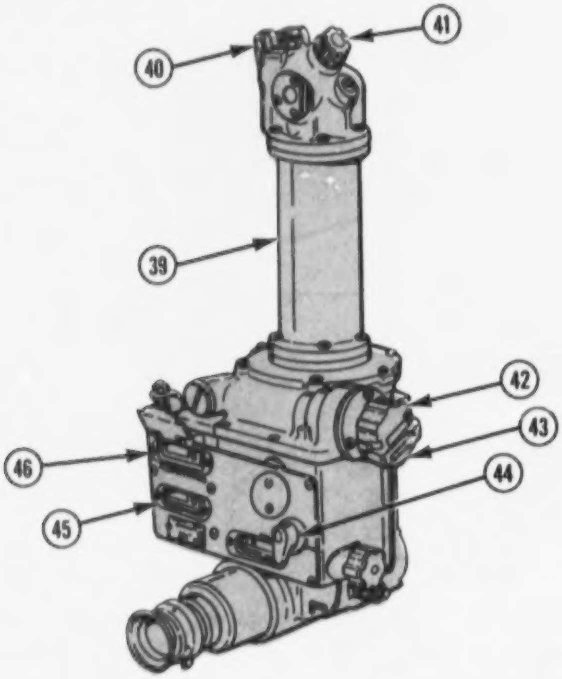
ELEVATION COUNTER. The elevation counter (36) registers the cannon elevation in mils.

M18 FIRE CONTROL QUADRANT. The M18 fire control quadrant (37) controls cannon elevation during all operations.

CROSS LEVEL CONTROL KNOB. Turning the cross level control knob (38) centers the bubble in the cross level vial (33).

CONTROLS AND INDICATORS—Continued

137 PANORAMIC TELESCOPE



M137 PANORAMIC TELESCOPE. The M137 panoramic telescope (pantel) (39) provides direction in indirect fire operations.

PARALLAX SHIELD. The parallax shield (40) reduces distortion and glare and protects the lens.

ELEVATION KNOB. Turning the elevation knob (41) raises and lowers the reticle pattern in the pantel (39).

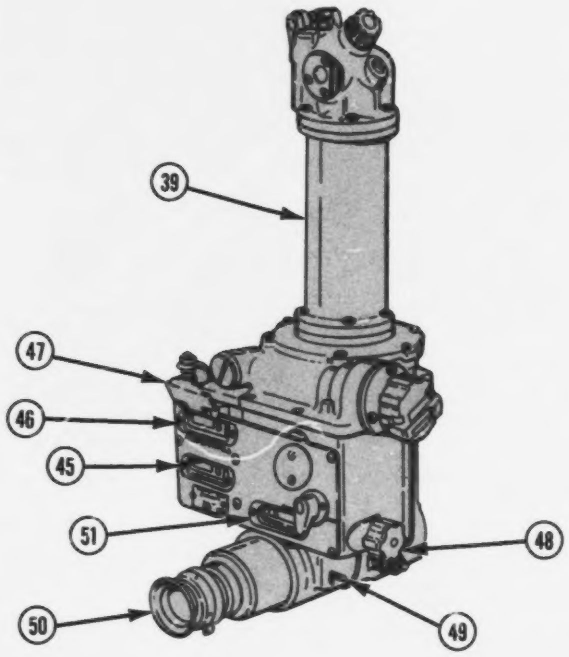
AZIMUTH KNOB. Turning the azimuth knob (42) turns the top of the pantel (39) and changes the readings in the deflection counter (45) and the azimuth counter (46).

AZIMUTH KNOB BAR. When the azimuth knob bar (43) is turned clockwise (so the word, DIRECT, faces the gunner), the pantel (39) will click every 5 mils.

DEFLECTION CLUTCH. When the deflection clutch (44) is pushed to the left, it keeps he deflection counter (45) from moving while the azimuth knob (42) is turned.

CONTROLS AND INDICATORS—Continued

M137 PANORAMIC TELESCOPE—Continued



GUNNER'S AID KNOB. When turned, the gunner's aid knob (48) changes the reading in the correction counter (51).

LOCKING PIN. When raised, the locking pin (49) locks the elbow assembly with eyepiece (50). When the locking pin is depressed, the elbow assembly and eyepiece may be moved horizontally.

EYEPIECE. The eyepiece (50) provides a means to look through the pantel (39), protects the eye, and prevents fogging.

CORRECTION COUNTER. The correction counter (51) registers left and right correction values in mils.

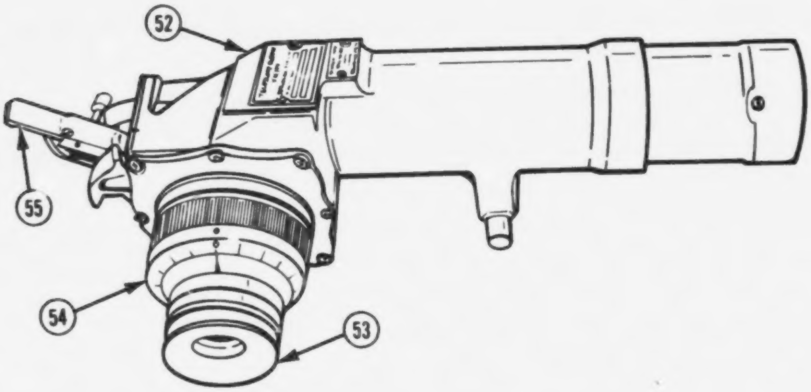
DEFLECTION COUNTER. The deflection counter (45) registers deflection movement in mils.

AZIMUTH COUNTER. The azimuth counter (46) registers azimuth travel in mils.

AZIMUTH COUNTER DOOR. The azimuth counter door (47) covers and protects the azimuth counter (46).

CONTROLS AND INDICATORS—Continued

M138 ELBOW TELESCOPE



M138 ELBOW TELESCOPE. The M138 elbow telescope (52) provides direction in direct fire operations.

EYEPIECE. The eyepiece (53) provides a means to look through the elbow telescope (52) and protects the eye.

DIOPTER SCALE. The diopter scale (54) provides individual focus.

LOCKING LATCH. The locking latch (55) holds the elbow telescope (52) to the M172 telescope and quadrant mount.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-2. GENERAL

a. **Before You Operate.** Always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS.

b. **While You Operate.** Always keep in mind the CAUTIONS and WARNINGS. Perform your during (D) PMCS.

c. **After You Operate.** Be sure to perform your after (A) PMCS.

d. **If Your Equipment Fails to Operate.** Troubleshoot with proper equipment. Report any deficiencies, using the proper forms (see DA PAM 738-750).

2-3. PMCS PROCEDURES

a. The PMCS table (p 2-13) lists these required daily checks when the howitzer is fired and the weekly checks required when the howitzer is not fired. The crewman responsible for each check is listed in the Done by column. The services are divided as follows:

(1) **Before operation service.** This is a brief service to ensure the weapon is ready for operation.

(2) **During operation service.** This service consists of detecting unsatisfactory performance while operating the howitzer. The operator or crew should be alert for unusual noises, odors, or any other malfunction on any part of the howitzer.

(3) **After operation service.** This is a daily service for the howitzer. It is designed to correct, where possible, all operation deficiencies so the howitzer will be ready to operate when required.

(4) **Weekly service.** This is a brief service to ensure the howitzer is ready for operation despite prolonged periods of nonoperation.

b. If anything looks wrong, and you cannot correct it yourself, write it on your DA Form 2404. If you find something serious, notify organizational maintenance immediately.

c. Before you begin to check specific items, remember that there are some things to be checked that are common in all areas to be inspected on the M198 howitzer. Always keep the items listed below in mind as you make your inspection and perform your PMCS.

(1) **Loose bolts.** While a loose bolt is sometimes difficult to spot without actually applying a wrench, you can often tell by loose or chipped paint around the bolt head and bare metal or rust at the base of the bolt head.

(1.1) **Lockwire.** Check for loose, broken, or missing lockwire. If loose, broken, or missing, notify organizational maintenance.

(2) **Welds.** Many items are attached to the carriage with welds. Damaged welds may be detected by rust or chipped paint where cracks occur.

(3) **Hoses and fluid lines.** Check all hoses and lines for signs of wear, leaks, loose clamps, and loose fittings. A stain around a fitting is a sign of a leak. The fitting should be either tightened, repaired, or replaced.

NOTE

Mission capable criteria has been included in the following table. The information normally found in the For readiness reporting...column is now in the Procedure column and is identified by an arrow.

The terms ready/available and mission capable refer to the same status: equipment is on hand and is able to perform its combat mission (see DA PAM 738-750).

Under normal operations both the M17 and M18 fire control quadrants are required for use. However, for PMCS purposes, only one of the fire control quadrants is required for the M198 howitzer to be serviceable.

Preventive Maintenance Checks and Services

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY	
1	●				CS	DA FORM 2408-4 a. Check to see if your weapon has been borescoped within 90 days immediately preceding firing and after every 1000 EFC rounds; pullover gaged every 1000, 1500, and every 100 EFC rounds thereafter (TM 9-1000-202-14).	Weapon has not been borescoped/pullover gaged in accordance with instructions.
			●			b. Record number of rounds fired.	

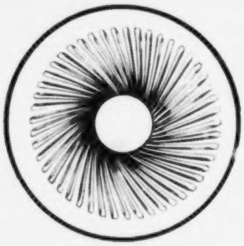
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY—Continued	
2					No. 1	BORE AND CHAMBER  **NOTE** The cannon tube may be cleaned and lubricated using the artillery cleaning kit or using CLP without the kit. Whichever method is used, cleaning begins immediately after firing is completed and continues until all steps are performed. For non-firing periods, the cannon tube is cleaned and lubricated on a weekly basis. If using CLP (item 1.1, app D), proceed as follows: a. On day of firing. (1) Attach bore-brush assembly to rammer staff. Inspect breech and tube and clear obstructions. **NOTE** Shake (mix) CLP (item 1.1, app D) well before each use.	

Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY—Continued (2) Apply 1 to 2 ounces of CLP (item 1.1, app D) to bore brush and thoroughly wet punch cannon bore three times. Wrap clean wiping rags (item 13, app D) around bore brush and dry punch the bore two times. Wrap clean wiping rags (item 13, app D) around bore brush, soak with CLP (item 1.1, app D), and punch cannon bore one time. b. On day after firing. (1) Repeat the steps for day of firing. (2) Wrap bore brush with clean wiping rags (item 13, app D) and dry punch tube once forward and once back. Wrap bore brush with clean wiping rags (item 13, app D) and pour on 2 ounces CLP (item 1.1, app D) and wet punch entire tube once forward and once back. Repeat last step with 2 more ounces of CLP. OR If using the artillery cleaning kit (item 9.2, app D), proceed as follows: c. On day of firing. (1) Attach nylon bristle bore-brush assembly to rammer staff. Inspect breech and tube and clear obstructions. Wet punch the tube as follows:	

Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section **G—Gunner** **AG—Assistant Gunner**

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before **D—During** **A—After** **W—Weekly**

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY—Continued BORE AND CHAMBER — Continued NOTE Shake (mix) CLP (item 9.2, app D) well before each use. (2) Pour 1/4 of the premeasured bottle (3.5-ounce bottle) of CLP (item 9.2, app D) onto brush and punch the tube once forward and once back. (3) Pour second 1/4 of the premeasured bottle of CLP (item 9.2, app D) onto brush and scrub back and forth the entire length of the tube. (4) Repeat above step with third 1/4 of premeasured bottle of CLP (item 9.2, app D). (5) Pour final 1/4 of the premeasured bottle of CLP (item 9.2, app D) onto brush. Wet punch the entire length of the tube once forward and once back. d. On day after firing. (1) Attach nylon bristle bore-brush assembly to rammer staff. Wet punch the tube following the procedures for day of firing above.	

Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY—Continued	
						(2) Wrap the brush with a new disposable cleaning sleeve and dry punch the entire length of the tube once forward and back. Remove and dispose of the sleeve. (3) Wrap the brush with a new disposable cleaning sleeve and pour on 1/2 of the premeasured bottle of CLP (item 9.2, app D). Wet punch the entire length of the tube once forward and once back. Remove and dispose of the sleeve. (4) Repeat above step with the last 1/2 of the premeasured bottle of CLP (item 9.2, app D). **NOTE** If the tube has not been previously cleaned with CLP and there is a heavy buildup of coppering or carbon deposits, or severe heat cracking, it may be necessary to repeat cleaning instructions until the tube has been thoroughly cleaned with CLP. e. Inspect front and rear of bore and chamber to determine condition.	There are any cracks or defects in the metal.

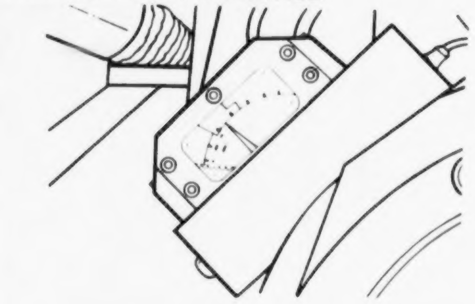
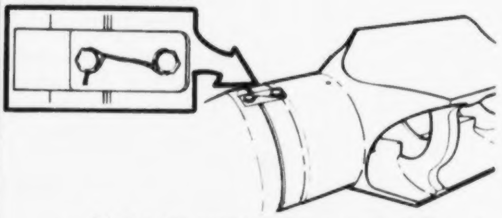
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section **G—Gunner** **AG—Assistant Gunner**

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before **D—During** **A—After** **W—Weekly**

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY—Continued	
3					No. 1	THERMAL WARNING DEVICE 	
	●					a. Inspect for moisture inside TWD (fogging of window).	
	●	●				b. Check operation of TWD. Indicator should show approximate outside temperature before firing and tube temperature during firing. If defective, notify organizational maintenance.	
4					No. 1	MUZZLE BRAKE 	
	●					a. Check for cracks over 1 inch (2.54 cm) long.	
	●					b. Check for loose bolts and missing or damaged parts on muzzle brake.	Muzzle brake cracks are over 1 inch (2.54 cm) long.

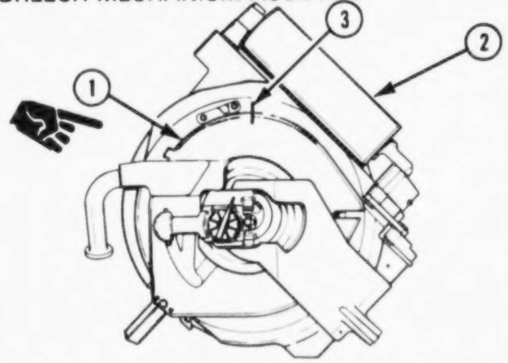
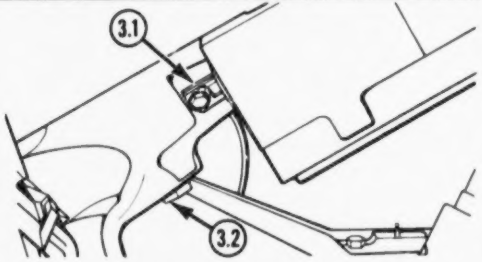
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
5					No. 1	DAILY—Continued BREECH MECHANISM ASSEMBLY 	
	●					a. Check breechblock assembly (1) and breech counterbalance (2) by opening and closing breechblock assembly. Check for smooth operation and alinement of witness marks (3).	The breechblock assembly will not close or the witness marks do not aline.
	●	●				 b. Check for loose bolts and missing or damaged parts, especially the torque key (3.1) and tube lock key (3.2). If bolts are loose or missing, or parts are damaged, notify organizational maintenance.	Torque key or tube lock key missing.

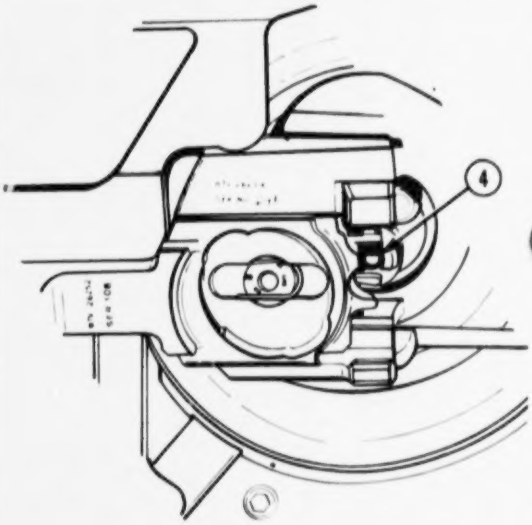
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W		Procedure	
						DAILY—Continued	
5					No. 1	BREECH MECHANISM ASSEMBLY—Continued	
							
		●	●			c. Inspect primer cavity (4) for corrosion or powder fouling. Clean primer cavity by inserting reamer assembly as far as it will go and briskly rotating reamer assembly. Remove loosened powder with primer cleaning brush.	
			●			d. Disassemble (p 3-35) and clean all surfaces of the firing mechanism with CLP (item 1.1, app D). Inspect for damaged parts. Wipe dry and apply a light coat of CLP (item 1.1, app D) on all surfaces.	

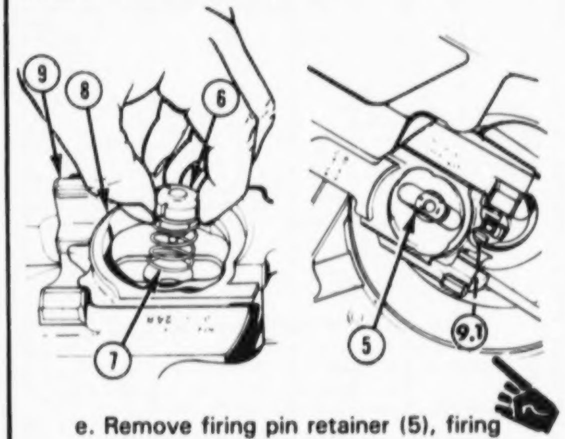
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY—Continued	
5					No. 1	BREECH MECHANISM ASSEMBLY—Continued	
							
			●			e. Remove firing pin retainer (5), firing pin (6), and spring (7) from firing mechanism block assembly (8) (p 3-40). Clean all surfaces with CLP (item 1.1, app D). Inspect firing pin and spring for damage. Wipe dry and apply a light coat of CLP (item 1.1, app D) on all surfaces.	
			●			f. Clean firing mechanism housing assembly (9) (including extractor (9.1)) with CLP (item 1.1, app D). Wipe dry and apply a light coat of CLP (item 1.1, app D) on all surfaces.	
			●			g. Clean sliding surfaces of breech mechanism assembly. Remove any burrs.	
			●			h. Apply a light coat of CLP (item 1.1, app D) between surfaces of breechblock assembly and carrier pilot.	

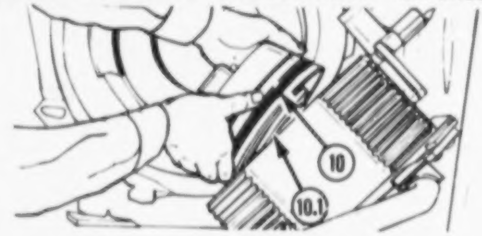
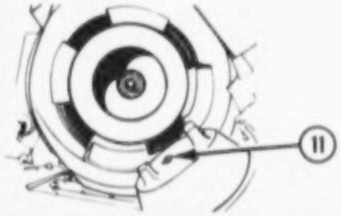
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
5					No. 1	DAILY—Continued BREECH MECHANISM ASSEMBLY—Continued  **CAUTION** **Do not clean obturator pad (10) with CLP. Use soap (item 14, app D) and water only.**	
			●			i. Remove obturator spindle assembly (10.1) and disassemble (p 3-43). Inspect and clean obturator pad (10) and all other surfaces that have come into contact with powder. 	
		●	●			j. Check to be sure that vent hole (11) in obturator spindle assembly is clear. Run primer cleaning brush through vent hole several times with push pull movement or by inserting vent cleaning tool completely through vent and rotating it clockwise until clean. Clean any traces of powder residue with CLP (item 1.1, app D). Wipe dry and lube with CLP (item 1.1, app D) (LO 9-1025-211-13) if firing is not anticipated.	

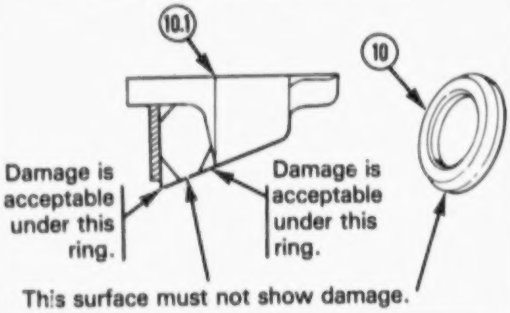
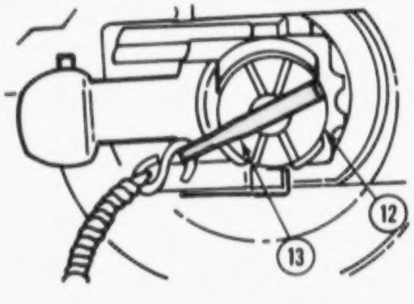
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY—Continued	
5					No. 1	BREECH MECHANISM ASSEMBLY—Continued	
			●			k. Inspect obturator pad for damage.  10.1 10 Damage is acceptable under this ring. Damage is acceptable under this ring. This surface must not show damage.	Outside diameter of primary and spare obturator pads is not smooth.
	●					 l. Place firing mechanism (12) in firing position and check for proper operation by manually tripping the lanyard lever (13).	Either the primary or spare firing mechanism does not operate properly.

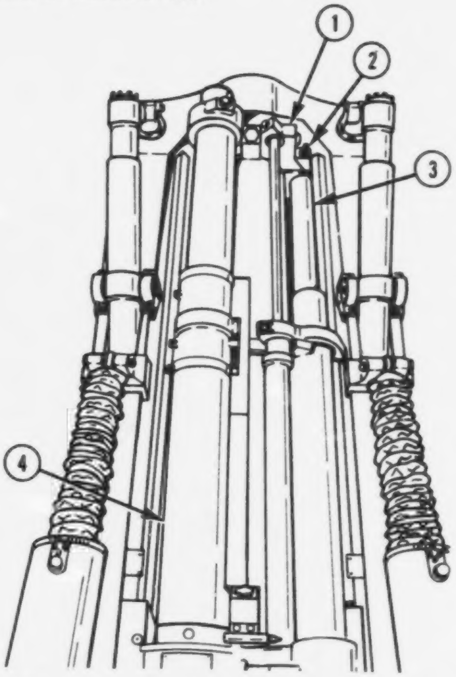
Preventive Maintenance Checks and Services – Continued

ATC–Ammunition Team Chief

CS–Chief of Section G–Gunner AG–Assistant Gunner

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B–Before D–During A–After W–Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY–Continued	
6					AG	RECOIL MECHANISM 	
		●	●			a. Check recoil mechanism for oil leakage at front yoke assembly (1), oil valve assembly (2), recoil cylinder assemblies (3), and recuperator cylinder assembly (4). Oil leakage from back of recoil cylinder assemblies is considered normal unless leakage is over two reserves per day during firing. If leakage is from other points or is more than two reserves per day, notify organizational maintenance.	

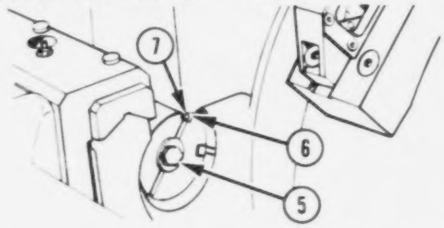
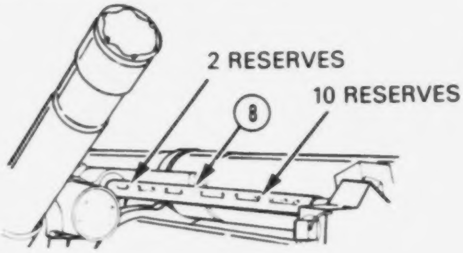
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section **G—Gunner** **AG—Assistant Gunner**

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before **D—During** **A—After** **W—Weekly**

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
6					AG	DAILY—Continued RECOIL MECHANISM—Continued 	
	●					b. Clean with a wiping rag (item 13, app D) and cleaning compound (item 2, app D) all foreign material from safety relief valves (5) at rear of recoil cylinder assemblies. Check for presence of restraint key (6) and capscrew (7).	Restraint key or capscrew missing from one or both recoil cylinder assemblies.
						NOTE The oil reserve indicator must be visible at all times. Clean firing residue from top and bottom recoil mechanism rails. 	
	●	●				c. Check that the oil reserve indicator (8) is on or between two and 10 reserves.	Oil leakage is over two reserves per day or if indicator shows no oil reserves.

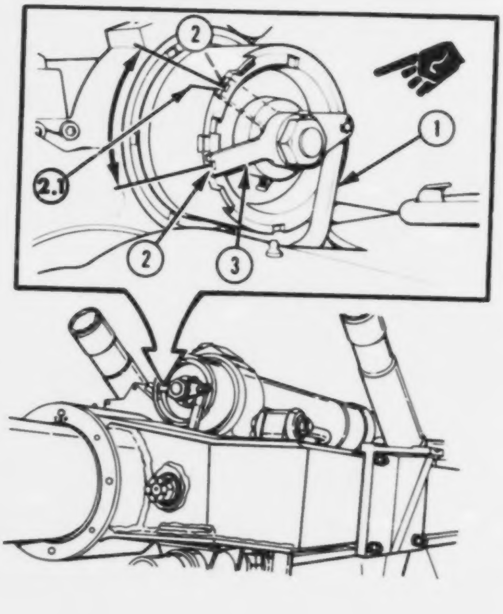
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY—Continued	
6					AG	RECOIL MECHANISM—Continued	
		●				d. Check for smooth operation, length of recoil, and complete movement to battery position without shock. **NOTE** To observe the 55-degree mark from the ground, right side of weapon, apply a chalk mark (2.1) on the outside dimension of the recuperator cylinder.	
7						CARRIAGE 	

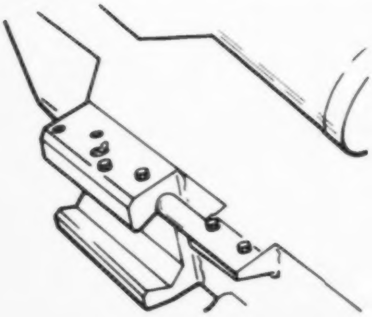
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
7						DAILY—Continued CARRIAGE—Continued **WARNING** **Make sure personnel are clear of cannon recoil path. Loss of nitrogen pressure can allow cannon to fall out of battery.**	
	●				CS & AG	a. Check for proper operation of variable recoil rigid connecting link (1) by elevating and depressing weapon (p 2-2) throughout the elevation range. Make sure cannon and recoil remain in the in-battery position. The 55-degree (from vertical) scribe line on end of recuperator cylinder should lie within notch (2) on end of lever (3) when cannon is at 1025 mils elevation or more.	The variable recoil rigid connecting link does not move. Cannon will not remain in the in-battery position when weapon is elevated.
							
		●			AG	b. Lube cradle guide assembly with WTR grease (item 9, app D) during excessive firing.	

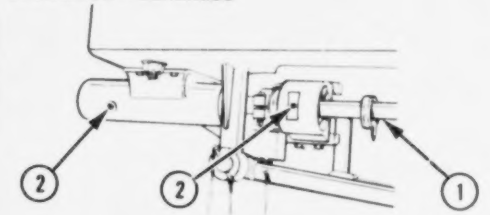
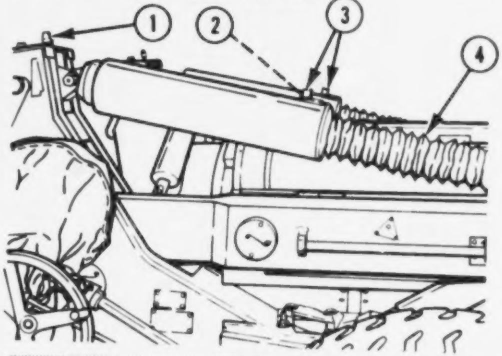
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
7						DAILY—Continued CARRIAGE—Continued 	
	●				AG	c. Clean residue from variable recoil shaft (1) with rag (item 13, app D).	
			●		AG	d. Lube fittings (2) with WTR grease (item 9, app D).	
8					AG	EQUILIBRATOR CYLINDERS  **WARNING** **Make sure personnel are clear of cannon recoil path. Loss of nitrogen pressure can allow cannon to fall out of battery.**	
	●					a. Elevate and depress weapon (p 2-2). It should take the same effort to elevate and depress the weapon. If not, adjust the equilibrator (p 3-55).	

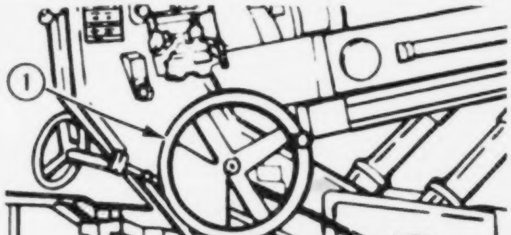
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
8					AG	DAILY—Continued EQUILIBRATOR CYLINDERS—Continued	
			●	●		b. Inspect for moisture or foreign matter in top carriage recesses around or on equilibrator adjusting screws (1) or around both check valves (2) and caps (3). Remove any foreign matter with rag (item 13, app D).	
				●		c. Coat equilibrator adjusting screw (1) with WTR grease (item 9, app D).	
			●	●		d. Check for evidence of oil leakage on both ends of bellows (4).	Adjustment of equilibrator cannot be obtained by adjusting screw.
9					AG	ELEVATING MECHANISM  	
	●					a. Check for smooth operation, making sure there is no binding or jerking motion and that backlash of handwheel (1) is not more than 1/12 turn of handwheel (4-1/4 in. (10.79 cm)).	

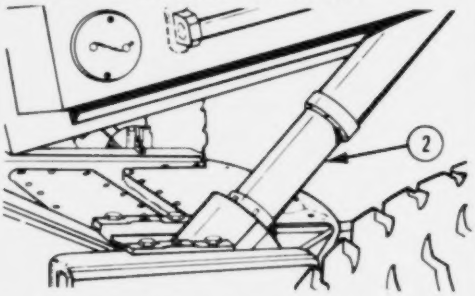
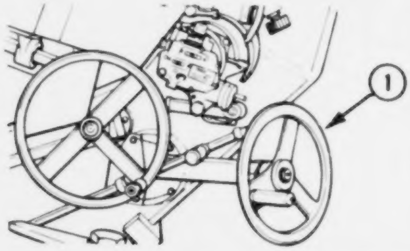
Preventive Maintenance Checks and Services – Continued

ATC – Ammunition Team Chief

CS – Chief of Section G – Gunner AG – Assistant Gunner

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B – Before D – During A – After W – Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
9						DAILY – Continued ELEVATING MECHANISM – Continued 	
	●					b. Inspect and clean the exposed cylinders (2) with a rag (item 13, app D) to ensure they are free from dirt, burrs, and scoring. c. Check for proper operation.	The elevating mechanism does not operate.
10					G	TRAVERSING MECHANISM 	
	●					Check for smooth operation, making sure there is no binding or jerking motion and the backlash of the handwheel (1) is not more than 1/12 turn of the handwheel (3-1/8 in. (7.94 cm)).	Traversing mechanism does not operate.

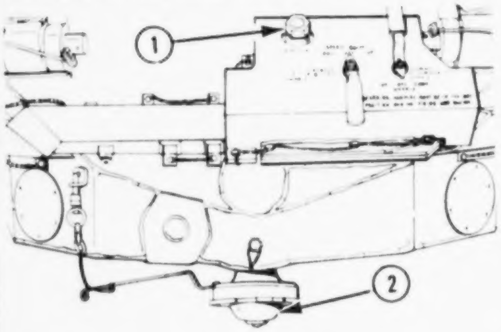
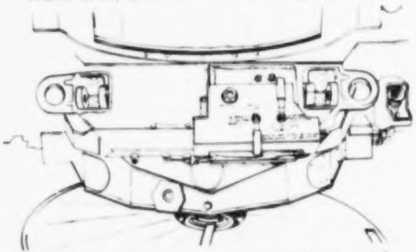
Preventive Maintenance Checks and Services – Continued

ATC – Ammunition Team Chief

CS – Chief of Section G – Gunner AG – Assistant Gunner

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B – Before D – During A – After W – Weekly

Item no.	Interval B	Interval D	Interval A	Interval W	Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
						DAILY – Continued	
11					No. 3	BOTTOM CARRIAGE, FIRING BASE BALL, FIRING BASEPLATE AND MANIFOLD  **NOTE** Make sure levers are in OFF position.	
			●			a. Check hydraulic system fluid level on dipstick (1). Fill as required with OHT (item 9.1, app D).	
	●					b. Make sure the firing base ball (2) is free from dirt, burrs, and scoring. Do not lube. 	
	●					c. Inspect firing baseplate and attaching hardware for completeness.	Locking assembly does not operate, is broken, or does not lock into place because of cracks in firing baseplate.

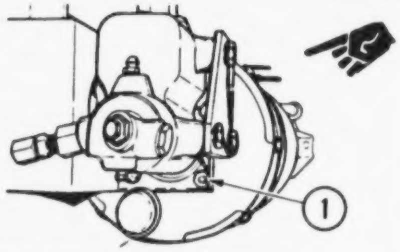
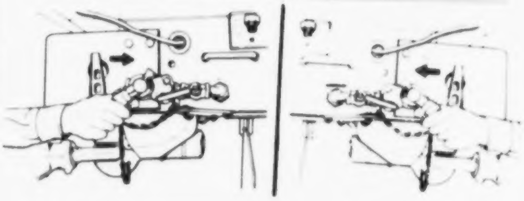
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
12						DAILY—Continued EMERGENCY AND SERVICE HOSE ASSEMBLIES  	
	●				AG	a. Connect hose assemblies to prime mover. Check length of travel of power booster indicator rod (1) while prime mover brakes are applied. If indicator rod moves more than 1-3/4 inches (4.45 cm), notify organizational maintenance. **WARNING** **Never disconnect hose assemblies before closing prime mover cutout cock to prevent injury from air pressure.** 	
	●				No. 4 & No. 5	b. Close prime mover cutout cock. Disconnect hose assemblies from prime mover. This should set the brakes automatically on howitzer. Move howitzer slightly with prime mover to assure brakes are set.	Emergency brakes do not operate.

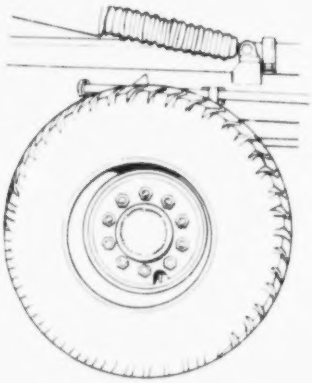
Preventive Maintenance Checks and Services — Continued

ATC – Ammunition Team Chief

CS – Chief of Section G – Gunner AG – Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B – Before D – During A – After W – Weekly

Item no.	Interval B	Interval D	Interval A	Interval W	Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
						DAILY – Continued	
13					G	WHEEL AND AXLE 	
						CAUTION Never reinflate a tire that has been run flat without first having the wheel and tire disassembled and inspected by the battery motor pool.	
	●					Check tires for cuts, nails, bulges, and proper inflation (45 psi (3.16 kg/cm^2) for wide, 100-105 psi (7-7.35 kg/cm^2) for narrow, and 110 psi (7.73 kg/cm^2) for radial). Check that lug nuts are tight.	One or both tires are flat or missing. Tread depth is 1/16 inch (1.59 cm) or less.

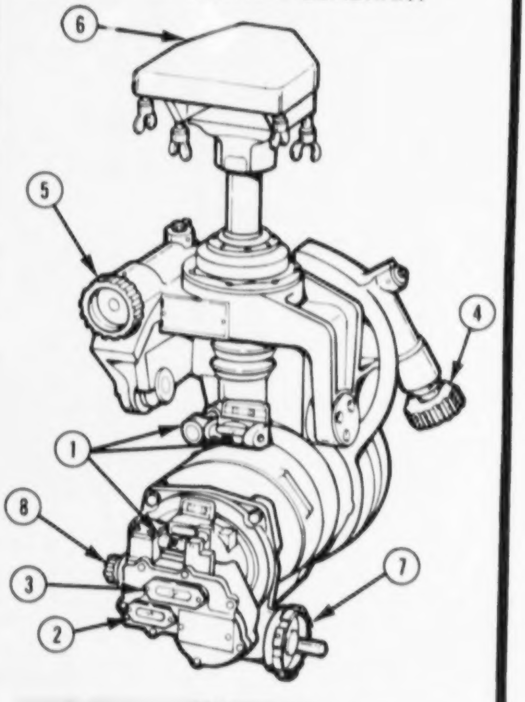
Preventive Maintenance Checks and Services – Continued

ATC–Ammunition Team Chief

CS–Chief of Section **G–Gunner** **AG–Assistant Gunner**

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B–Before **D–During** **A–After** **W–Weekly**

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY – Continued	
14					G	M171 TELESCOPE AND QUADRANT MOUNT AND M17 FIRE CONTROL QUADRANT	
							
						WARNING **If broken or not illuminated, follow radioactive materials procedures in the front of this manual.**	
	●					a. Check level vials (1) and counters (2 and 3) for illumination.	Level vials and counters are not illuminated or level vials are broken.

Preventive Maintenance Checks and Services – Continued

ATC – Ammunition Team Chief

CS – Chief of Section G – Gunner AG – Assistant Gunner

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B – Before D – During A – After W – Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY – Continued	
14					G	M171 TELESCOPE AND QUADRANT MOUNT AND M17 FIRE CONTROL QUADRANT – Continued	
	●					b. Marking must be clear on level vials and bubble must be present.	Bubble is missing.
	●					c. Turn pitch level control knob (4) and cross level control knob (5). Check for smooth operation.	The control knobs do not operate.
	●					d. M171 mount must have a cover (6). Mounting surface must not have any nicks or burrs. Clean surface with crocus cloth (item 5, app D) and wipe dry.	
	●					e. Turn elevation control knob (7). Elevation counter (2) should turn and elevation correction counter (3) should not turn.	Correction counter turns when elevation counter turns and M18 quadrant is nonoperational.
	●					f. Turn elevation correction knob (8). Elevation correction counter should move in 1-mil increments. Elevation counter should change by amount of correction applied.	Elevation correction counter does not move in 1-mil increments or the elevation counter is not accurate, and M18 quadrant is nonoperational.

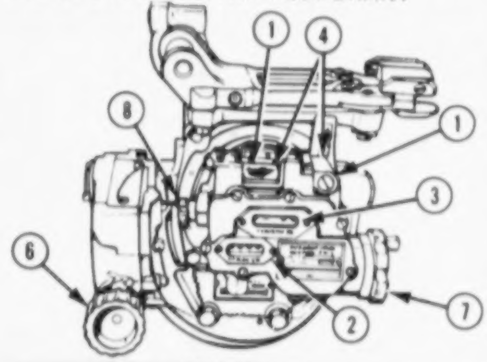
Preventive Maintenance Checks and Services – Continued

ATC – Ammunition Team Chief

CS – Chief of Section G – Gunner AG – Assistant Gunner

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B – Before D – During A – After W – Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY – Continued	
15					AG	M172 TELESCOPE AND QUADRANT MOUNT AND M18 FIRE CONTROL QUADRANT 	
						WARNING **If broken or not illuminated, follow radioactive materials procedures in the front of this manual.**	
	●					a. Check level vials (1) and counters (2 and 3) for illumination.	Level vials or counters are not illuminated or level vials are broken.
	●					b. Check that level vial covers (4) move freely. Markings on level vials must be clear, and there must be a bubble. Wipe level vials (1) and gunner's quadrant seats (5) clean with cheesecloth (item 6, app D) moistened with lens-cleaning compound (item 3, app D). Wipe dry.	Bubble missing from one or more level vials.
	●					c. Turn cross level control knob (6). Check for binding.	Cross level control knob does not operate.

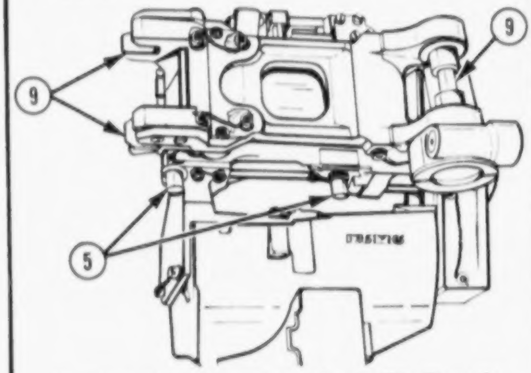
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval B	Interval D	Interval A	Interval W	Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
						DAILY—Continued	
15					AG	M172 TELESCOPE AND QUADRANT MOUNT AND M18 FIRE CONTROL QUADRANT —Continued 	
	●					d. Turn elevation control knob (7). Elevation counter (2) should turn, and elevation correction counter (3) should not turn.	Correction counter turns when elevation counter control knob is turned and M17 quadrant is nonoperational.
	●					e. Turn elevation correction knob (8). Elevation correction counter (3) should move in 1-mil increments. Elevation counter (2) should change by amount of correction applied.	Elevation correction counter does not move in 1-mil increments or the elevation counter is not accurate and the M17 quadrant is nonoperational.
	●					f. Telescope mounting surface (9) must not be nicked or burred. Clean surface with crocus cloth (item 5, app D).	

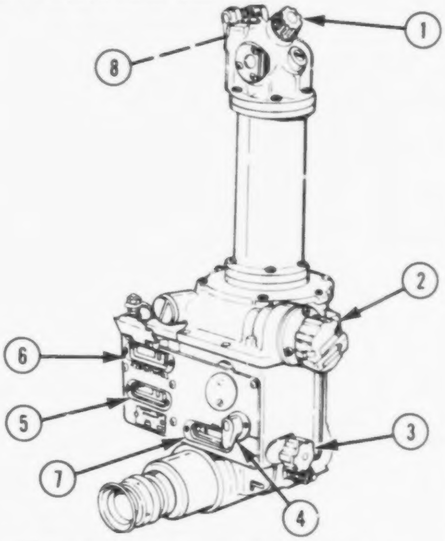
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY—Continued	
16					G	M137 PANORAMIC TELESCOPE 	
	●					a. All knobs (1, 2, 3, and 4) should turn freely. Check for rust or chipped paint. Clean with wiping rags (item 13, app D) moistened with cleaning compound (item 2, app D). Wipe dry.	Knobs do not turn.
						WARNING **If broken or not illuminated, follow radioactive materials procedures in the front of this manual.**	
	●	●				b. Check counters (5, 6, and 7) and reticles (8) for illumination.	Reticles or counters are broken or not illuminated.

Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section **G—Gunner** **AG—Assistant Gunner**

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before **D—During** **A—After** **W—Weekly**

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY — Continued	
16					G	M137 PANORAMIC TELESCOPE—Continued	
	●					c. Install telescope on mount (p 2-64) and check for tight mounting.	Telescope cannot be secured to mount.
	●					d. Turn azimuth knob (2). Deflection counter (5) and azimuth counter (6) should turn; correction counter (7) should not turn.	Counters will not turn or correction counter turns.
	●					e. Turn gunner's aid knob (3). It should move in 1-mil increments. Deflection counter (5) should change by amount of correction applied. Azimuth counter (6) should not change.	Gunner's aid knob will not move in one direction or in 1-mil increments, or if deflection and azimuth counters are incorrect.
	●					f. Check reticle image.	Reticle image is not clearly visible.
	●					g. Turn deflection clutch (4) to RELEASE position. Turn azimuth knob (2). Deflection counter (5) should not turn and azimuth counter (6) should turn. Turn deflection clutch back to the ENGAGE position.	Deflection counter turns.
	●					h. Deleted.	

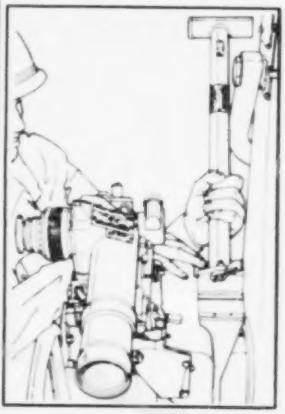
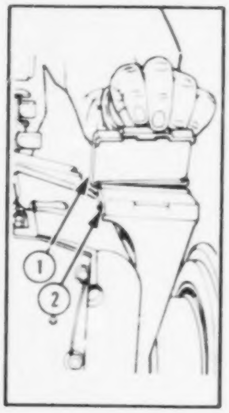
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY – Continued	
17						M139 ALINEMENT DEVICE   **WARNING** **If broken or not illuminated, follow radioactive materials procedures in the front of this manual.**	
	●				AG	a. Check for illumination.	
	●				AG	b. Remove protective cover (1). Check mounting surface for nicks and burrs. Install alinement device on trunnion dovetail (2), and check for tight mounting.	
					G	c. Check pantel with alinement device (p 2-77). If pantel mount cannot be alined to 4800 mils ±0.5-mil tolerance notify organizational maintenance.	

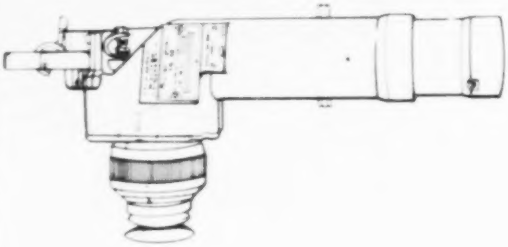
Preventive Maintenance Checks and Services — Continued

ATC — Ammunition Team Chief

CS — Chief of Section G — Gunner AG — Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B — Before D — During A — After W — Weekly

Item no	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY — Continued	
18					AG	M138 ELBOW TELESCOPE  **WARNING** **If broken or not illuminated, follow radioactive materials procedures in the front of this manual.**	
	●					a. Check reticle image for illumination.	
						Deleted.	
	●					b. Check optics. Diopter scale should turn freely and allow individual focus. No inside moisture is allowed.	
	●					c. Mount telescope and check for secure mounting (p 2-67).	
						Deleted.	

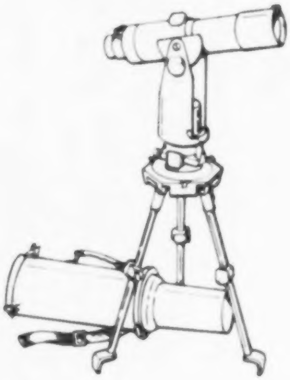
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section **G—Gunner** **AG—Assistant Gunner**

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before **D—During** **A—After** **W—Weekly**

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY – Continued	
19					No. 4	M1A1 COLLIMATOR 	
	●	●				a. Check to ensure collimator is complete and operating properly.	
	●	●				b. Check for dirt or condensation on internal optics.	
						WARNING **If broken or not illuminated, follow radioactive materials procedures in the front of this manual.**	
	●	●				c. Check reticle image for illumination.	

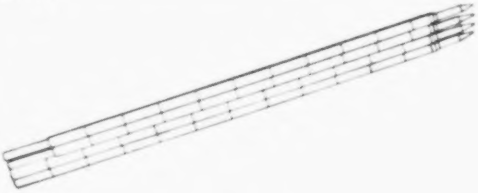
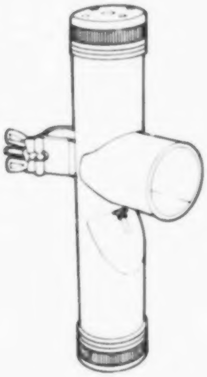
Preventive Maintenance Checks and Services – Continued

ATC – Ammunition Team Chief

CS – Chief of Section G – Gunner AG – Assistant Gunner

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B – Before D – During A – After W – Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						DAILY – Continued	
20			●		No. 4	M1A2 AIMING POST AND M14 AIMING POST LIGHTS   **WARNING** (Deleted) Check for damage; clean and stow.	

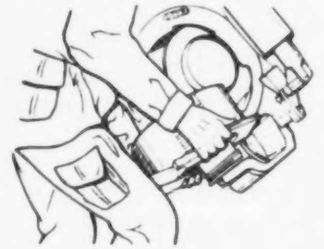
Preventive Maintenance Checks and Services – Continued

ATC–Ammunition Team Chief

CS–Chief of Section **G–Gunner** **AG–Assistant Gunner**

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B–Before **D–During** **A–After** **W–Weekly**

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						WEEKLY **NOTE** If the howitzer is not operated or fired, you still have the responsibility of maintaining it in an operational condition. The following checks and services must be performed weekly and are the only PMCS required when the weapon is not operated. Service interval under normal conditions is weekly. Service more often to compensate for high or low temperatures or prolonged periods of high rates of operation.	
21				●	CS	EQUIPMENT RECORD FOLDER Check to see if you have your Equipment Record Folder. Make sure all the required forms (DA PAM 738-750) are present.	
22				●	No. 1	CANNON Remove breech mechanism cover and muzzle plug and inspect for moisture, rust, corrosion, or foreign matter. Clean with CLP (item 1.1, app D), wipe dry, and lube with CLP (item 1.1, app D).	
23					No. 1	BREECH MECHANISM ASSEMBLY 	

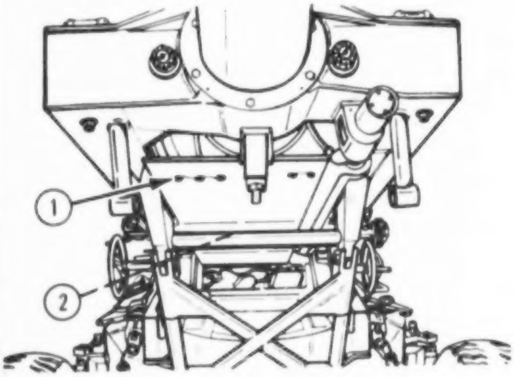
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						WEEKLY—Continued	
23				●	No. 1	BREECH MECHANISM ASSEMBLY—Continued	
						Remove breechblock assembly from carrier (p 3-47), clean with CLP (item 1.1, app D), wipe dry. Lube with CLP (item 1.1, app D).	
24					AG	RECOIL MECHANISM  	
				●		a. Check recoil mechanism for oil leakage (p 2-22).	
				●		b. Check for presence of lock wire on front yoke screws (1) and middle yoke screws (2). Do not tighten screws. If lock wire is broken or missing, and screws are loose, notify organizational maintenance.	

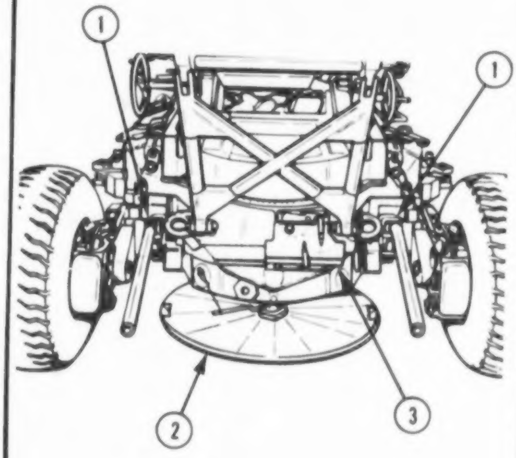
Preventive Maintenance Checks and Services – Continued

ATC – Ammunition Team Chief

CS – Chief of Section G – Gunner AG – Assistant Gunner

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B – Before D – During A – After W – Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						WEEKLY – Continued	
25				●	No. 3 & No. 4	SUSPENSION SYSTEM  Operate hydraulic pumps (1) and lower weapon onto firing baseplate (2) to check for proper operation of manifold assembly (3) and wheel and axle (p 2-5). Operate speed shift assembly (p 2-5) and check for proper operation.	Hydraulic pump or manifold assembly does not operate.

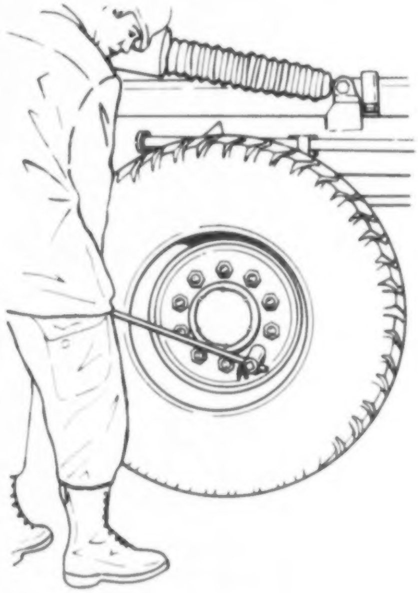
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						WEEKLY—Continued	
26					G	WHEEL AND AXLE	
							
				●		a. Check the wheel nuts. If loose, have organizational maintenance torque to 450-500 ft-lb (610.2-678 N·m).	
				●		b. Check wheels for dents or cracks.	
						Deleted.	

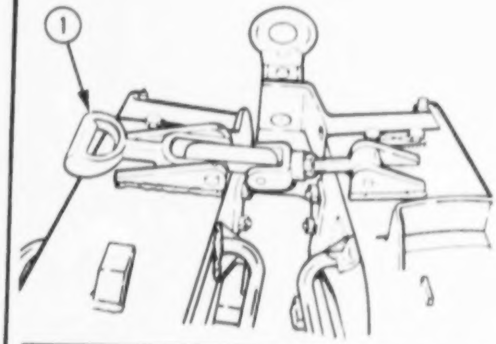
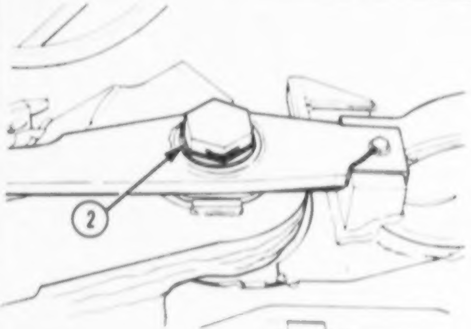
Preventive Maintenance Checks and Services – Continued

ATC – Ammunition Team Chief

CS – Chief of Section G – Gunner AG – Assistant Gunner

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B – Before D – During A – After W – Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED Procedure	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W			
						WEEKLY – Continued	
27					ATC	TRAILS  	
				●		a. Check trail lock (1) to assure trails will lock into closed position.	Trail lock does not operate.
				●		b. Check trail hinge pins (2) by opening and closing trails. Trails should not bind in either direction.	

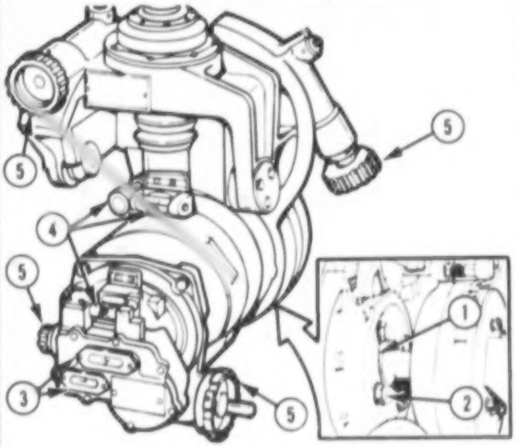
Preventive Maintenance Checks and Services — Continued

ATC—Ammunition Team Chief

CS—Chief of Section G—Gunner AG—Assistant Gunner

No. 1, 3, 4, and 5 — Cannoneers no. 1, 3, 4, and 5

B—Before D—During A—After W—Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W		Procedure	
						WEEKLY—Continued	
28					G	M171 TELESCOPE AND QUADRANT MOUNT AND M17 FIRE CONTROL QUADRANT	
							
				●		a. Check that lock wire (1) is fastened to mounting screws (2).	Mounting screws are loose or missing.
				●		b. Check all surfaces for dirt, dust, rust, moisture, and corrosion.	
						WARNING **If broken or not illuminated, follow radioactive materials procedures in the front of this manual.**	
				●		c. Check all illuminated counters (3) and vials (4) for illumination.	Counters or vials are broken or not illuminated.
				●		d. Turn all knobs (5) to check for proper operation and smoothness of operation.	

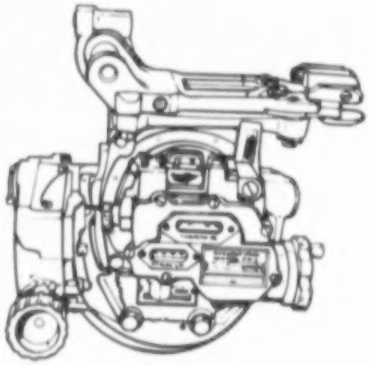
Preventive Maintenance Checks and Services – Continued

ATC–Ammunition Team Chief

CS–Chief of Section G–Gunner AG–Assistant Gunner

No. 1, 3, 4, and 5 – Cannoneers no. 1, 3, 4, and 5

B–Before D–During A–After W–Weekly

Item no.	Interval				Done by	ITEM TO BE INSPECTED	Equipment is NOT READY/ AVAILABLE IF:
	B	D	A	W		Procedure	
						WEEKLY–Continued	
29					AG	M172 TELESCOPE AND QUADRANT MOUNT AND M18 FIRE CONTROL QUADRANT 	
				●		Check that lock wire is fastened to mounting capscrews.	

All data on pages 2-49 through 2-52 deleted.

Section III. OPERATION UNDER USUAL CONDITIONS

2-4. GENERAL

a. This section contains instructions for the crew procedures necessary to operate the howitzer under normal conditions. For instructions for operating under unusual conditions, see page 2-114.

b. The personnel of the howitzer section consist of the following:

(1) A chief of section (CS) whose duties and responsibilities include the following:

(a) Training and efficiency of personnel.

(b) Performance of his section in training; firing, testing, and adjusting fire control equipment; and inspection and maintenance of all section equipment, including the prime mover.

(c) Observance of safety precautions.

(d) Preparation of field fortifications for protection of equipment, ammunition, and personnel.

(e) Camouflage discipline; local security; and radiological, biological, and chemical security discipline.

(f) Maintenance of forms in the equipment record folder.

(g) Policing the section area.

(h) Deleted.

(2) A gunner (G) who assists the chief of section in carrying out the duties specified in subparagraph (1) above. The gunner's specific duties are described in this manual.

(3) An ammunition team chief (ATC) who leads and directs the handling of ammunition and assists chief of section in the supervision of howitzer section. The ATC also performs duties as listed in this manual and other duties as directed.

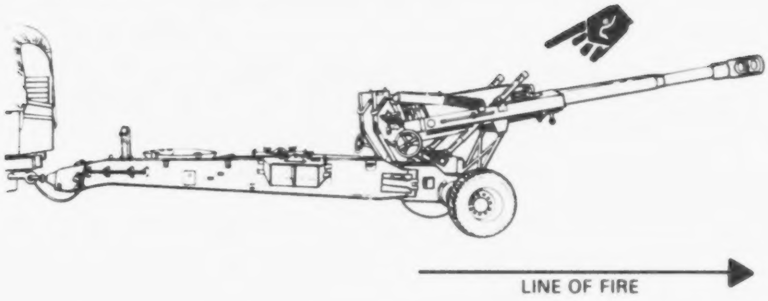
(4) An assistant gunner (AG) who assists the gunner and, in an emergency, acts as the gunner. The assistant gunner's specific duties are described in this manual.

(5) Five cannoneers, numbered 1 to 5, who perform duties as listed in this manual and other duties as directed.

(6) A driver (D) whose primary duty is to drive the prime mover of the section. Maintenance and other duties are described by this manual or directed by the chief of section.

c. Section equipment is listed in the appropriate tables of organization and equipment (TOE's) and appendix B (p B-1) of this manual.

* EMPLACING HOWITZER



CAUTION

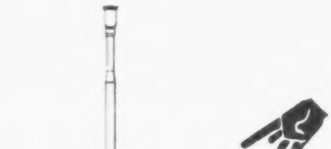
Do not use the firing baseplate and detent assembly as a speed shift assembly.

NOTE

Occupation of the firing section position is performed under the direct supervision of the chief of section. The prime mover should be driven into the firing position opposite the line of fire.

1 After prime mover comes to a complete stop, the chief of section commands, DISMOUNT. Upon hearing the command, the section exits through rear of prime mover.

2 All section members take position as illustrated.



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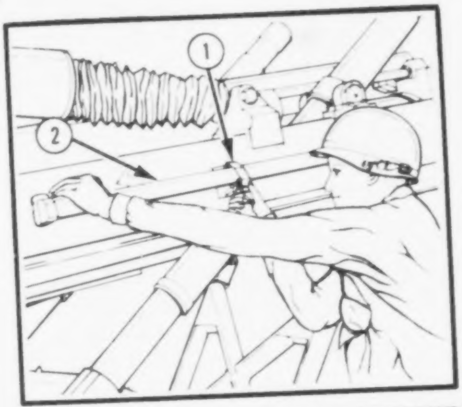
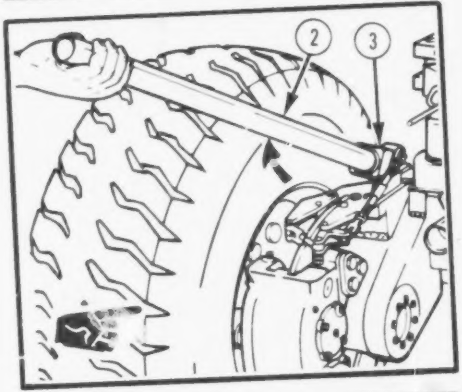
*Procedures for preparation for firing have been standardized under the Department of the Army Standardization Program.

EMPLACING HOWITZER—Continued

3 The chief of section commands, PREPARE FOR ACTION.

4 Assistant gunner unlatches holder (1) on right side and removes pump handle (2). Gunner unlatches holder on left side and removes pump handle.





WARNING

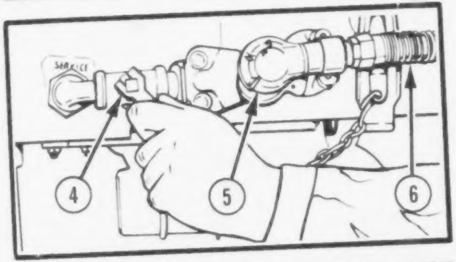
Handbrakes must be set in garrison as well as during field emplacement.

5 The gunner and assistant gunner set left and right handbrakes by inserting pump handles (2) into handbrake sockets (3) and raising up to the locked position.

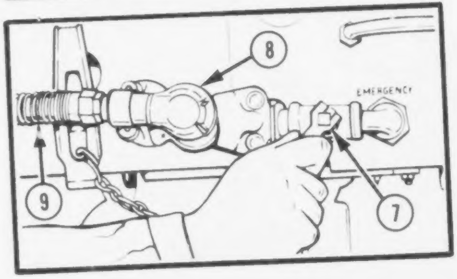
WARNING

Never disconnect hose before closing prime mover cutout cock to prevent injury to personnel.

6 Cannoneer no. 4 closes service air line cutout cock (4) at prime mover, uncouples service air line coupling (5), and passes hose assembly (6) to cannoneer no. 2.

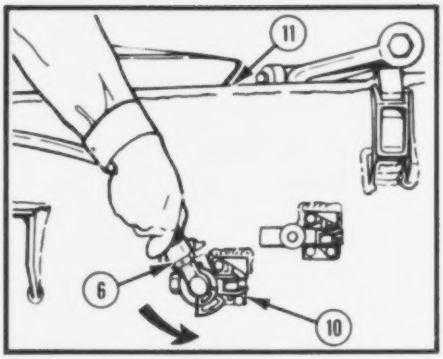


7 Cannoneer no. 5 closes emergency air line cutout cock (7) at prime mover, disconnects emergency air line coupling (8), and passes emergency hose assembly (9) to cannoneer no. 2.



EMPLACING HOWITZER—Continued

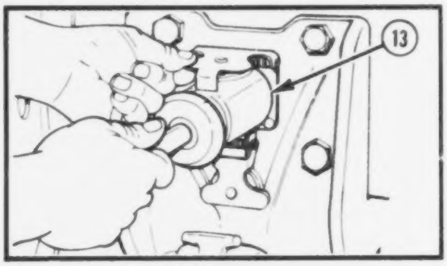
8 Cannoneer no. 4 connects service hose assembly (6) to dummy coupling (10) on right trail (11). The emergency hose assembly is connected to other dummy coupling.



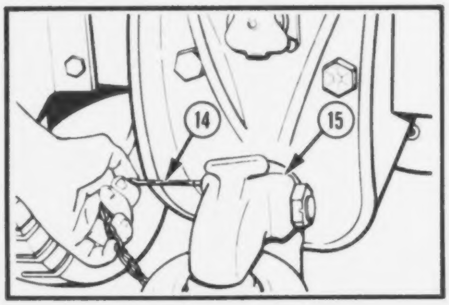
9 Deleted.

10 Cannoneer no. 5 disconnects cable assembly (13) from prime mover, if connected.

10.1 Deleted.

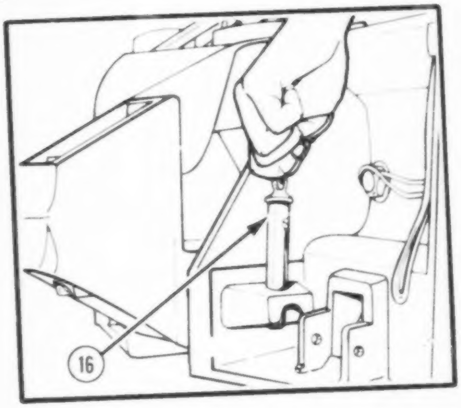


11 Cannoneer no. 4 removes cotter pin (14) and unlatches pintle (15) on prime mover.

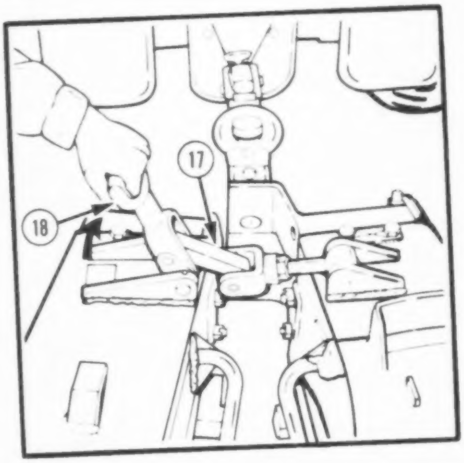


EMPLACING HOWITZER—Continued

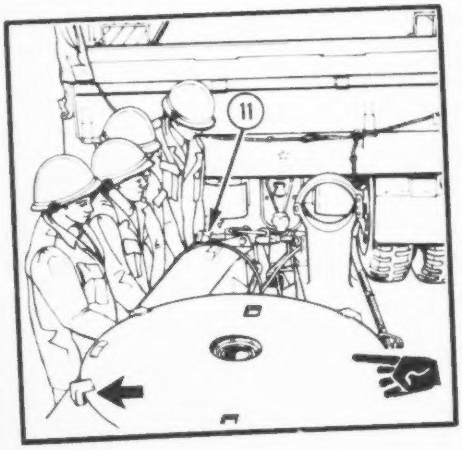
12 Cannoneer no. 4 removes trail retaining pin (16).



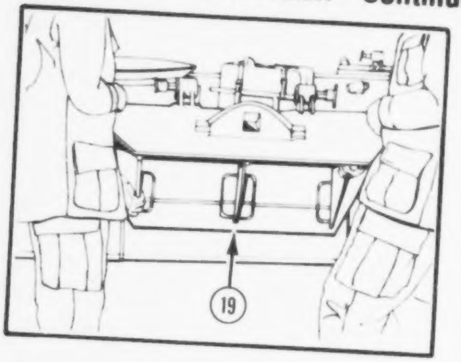
13 Cannoneer no. 4 unlocks trail lock (17) by pulling trail lock handle (18) straight up.

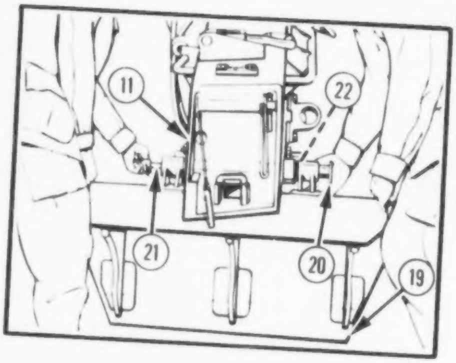


14 Cannoneers no. 2 and 4, the ammunition team chief, and the assistant gunner then open right trail (11).



EMPLACING HOWITZER—Continued

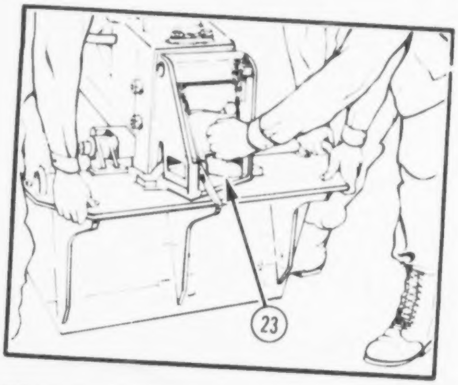




15 Cannoneers no. 2 and 4 remove right spade (19) and attach it to right trail (11) as follows:

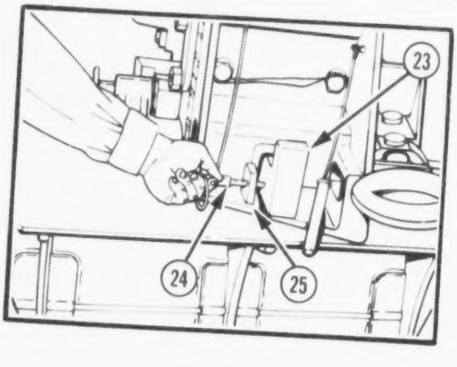
CAUTION
Do not use hammer on plunger weldment handles (20) when inserting pins (21).

a. Pull out plunger weldment handles (20) and lift right spade (19) straight up until pins (21) can be inserted in spade brackets (22).



NOTE
If necessary, use hand hammer (6-lb sledge) to drive spade key (23) far enough into position so that spade retaining pin (24) can be inserted.

b. Hold in position until the ammunition team chief inserts spade key (23) (stored on left trail) and secures spade key with spade retaining pin (24) through bracket (25).

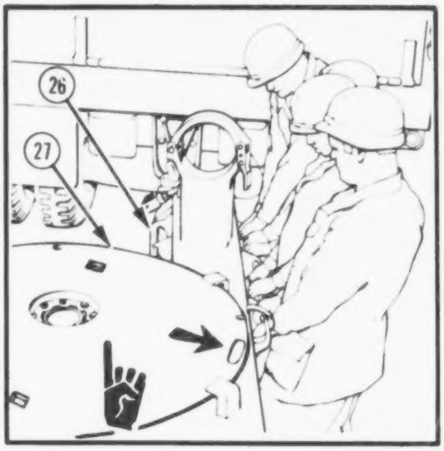


CAUTION
Do not fire howitzer without spade retaining pin (24) installed.

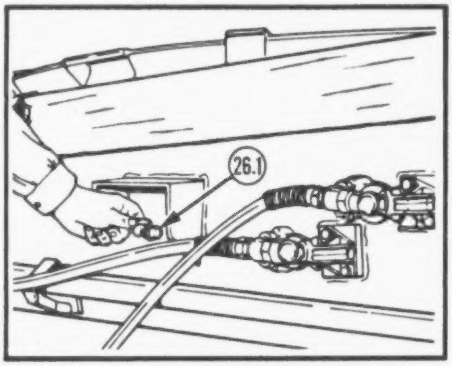
16 Cannoneers no. 1 and 3 remove left spade and bring spade to trail end. Cannoneers no. 1 and 3 attach spade to left trail while cannoneer no. 5 inserts spade key (23) and spade retaining pin (24) in left spade.

EMPLACING HOWITZER—Continued

17 Cannoneers no. 1, 3, and 5 and gunner (at left trail (26)), and the assistant gunner, the ammunition team chief, and cannoneers no. 2 and 4 (at right trail) raise lunette from pintle when the chief of section commands, LIFT. The chief of section then commands the driver to move prime mover forward. The left trail is spread, and then trails are lowered to the ground.



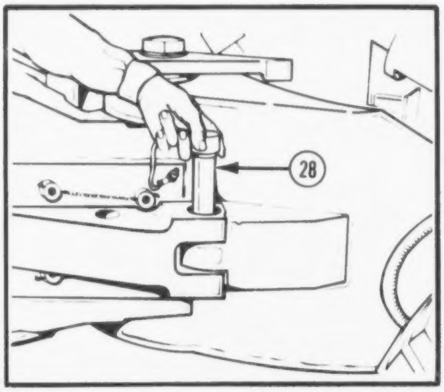
17.1 Cannoneer no. 4 opens drain cock (26.1) on emergency reserve air tank.



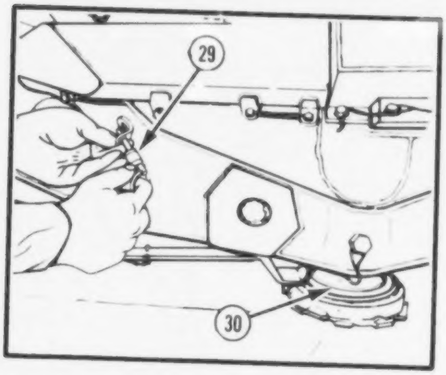
18 Cannoneers no. 3 and 4 remove firing baseplate (27) from left trail (26) and place it in front of howitzer.

WARNING
When installing locking plug (28) in the firing position, drive plug in firmly using a sledge hammer.

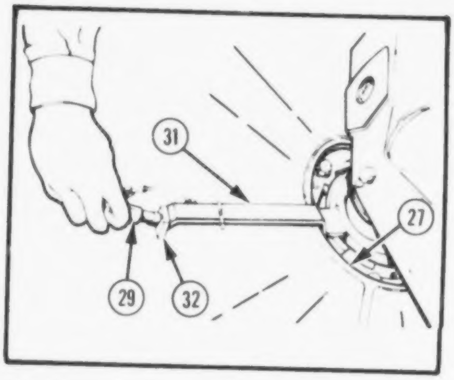
19 The gunner removes left locking plug (28) and the assistant gunner removes right locking plug from the stowed position (rear) and installs it in the firing position (front).



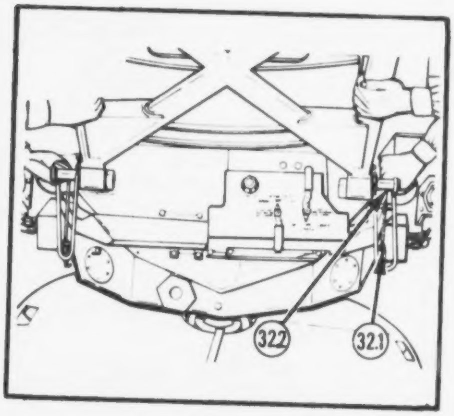
EMPLACING HOWITZER—Continued



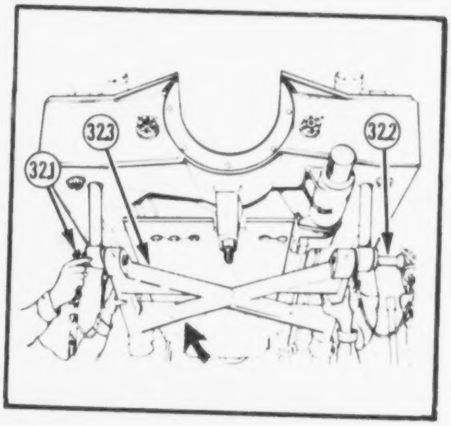
20 Cannoneer no. 4 removes quick release pin (29) and with cannoneer no. 3 lifts firing baseplate and positions it on ball (30).



21 Cannoneer no. 3 then locks firing baseplate (27) in place by positioning lock-release lever (31) with locking bracket (32). Cannoneer no. 3 then inserts quick release pin (29) in locking bracket.



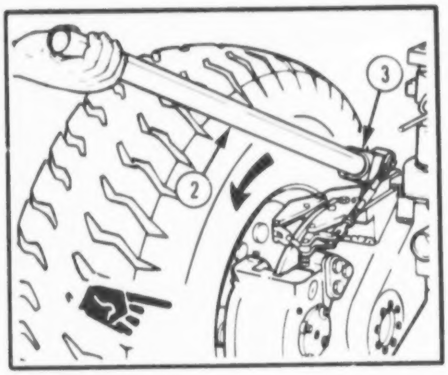
21.1 Cannoneer no. 3 removes left retaining pin (32.1) and travel lock pin (32.2). Cannoneer no. 4 removes right retaining pin and travel lock pin.



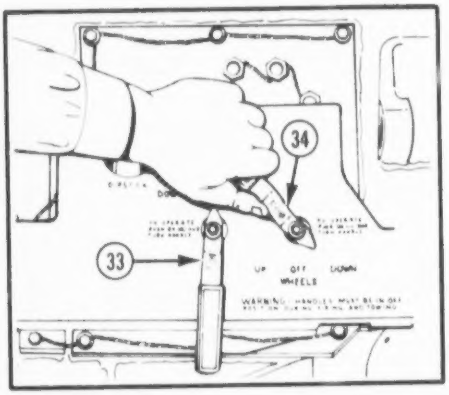
21.2 Cannoneers no. 3 and 4 swing travel lock assembly (32.3) up and insert travel lock pins (32.2) and retaining pin (32.1).

21.3 Deleted.

EMPLACING HOWITZER—Continued

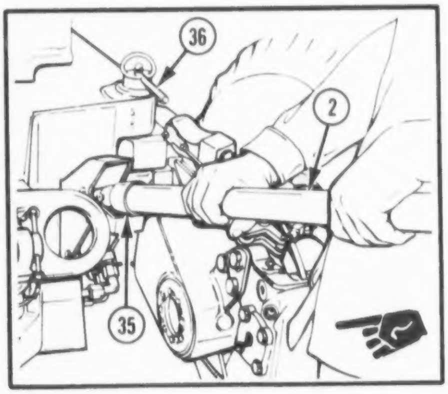


22 Cannoneer no. 3 releases left handbrake and cannoneer no. 4 releases right handbrake by inserting pump handle (2) in handbrake socket (3) and pulling down.



NOTE
Be sure to move WHEELS lever (34) all the way to the desired position.

23 Cannoneer no. 3 ensures SPEED-SHIFT lever (33) is in the OFF position and then pushes down and moves WHEELS lever (34) to the DOWN position.

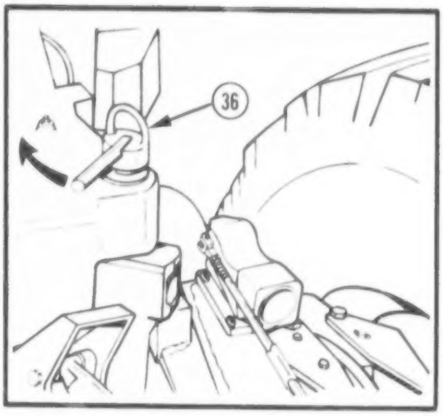


24 Cannoneer no. 4 inserts pump handle (2) into right hydraulic adapter (35), and cannoneer no. 3 inserts pump handle into left hydraulic adapter. They pump up and down until pressure is off wheel lock handles (36).

EMPLACING HOWITZER—Continued

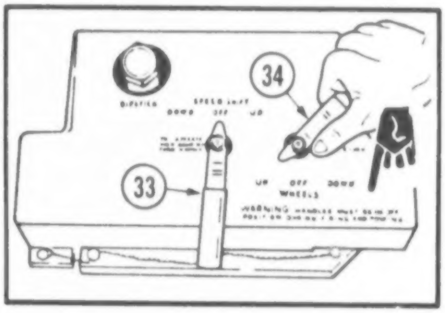
WARNING
Keep feet from under firing baseplate.

25 Cannoneer no. 4 moves right wheel lock handle (36) and cannoneer no. 3 moves left wheel lock handle to the released position by lifting up and turning handle towards center of howitzer.



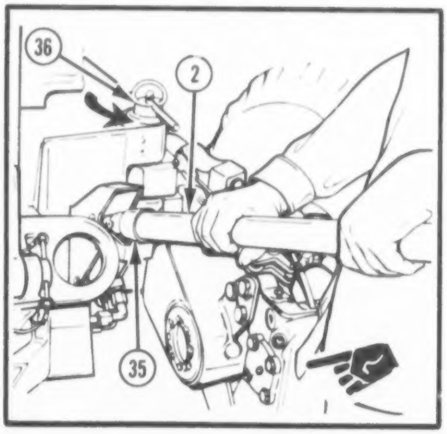
WARNING
Keep feet from under howitzer.

26 Cannoneer no. 3 pushes down and moves WHEELS lever (34) slowly to the UP position, allowing howitzer to settle on firing baseplate. Cannoneers no. 3 and 4 relock handbrakes by inserting pump handles in handbrake sockets and raising up to the locked position.



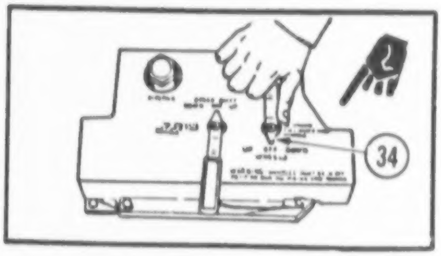
27 Cannoneers no. 3 and 4 then insert pump handles (2) into hydraulic adapters (35) and pump up and down until wheels are fully up.

28 Cannoneer no. 3 moves left wheel lock handle (36) and cannoneer no. 4 moves right wheel lock handle towards wheels to the locked position.



EMPLACING HOWITZER—Continued

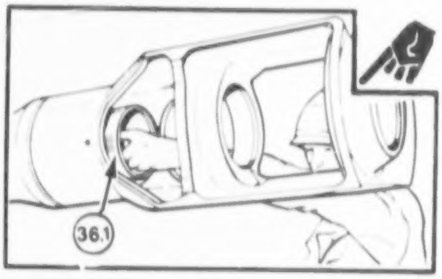
29 Cannoneer no. 3 pushes down and moves WHEELS lever (34) to the OFF position.



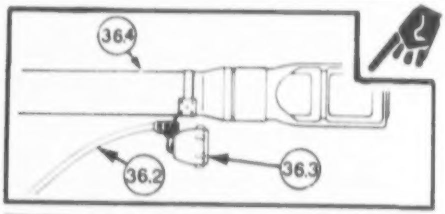
NOTE

Move WHEELS lever back and forth on either side of OFF mark to relieve pressure on the hydraulic system.

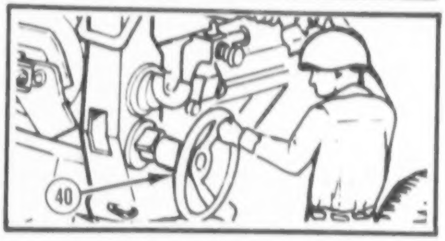
30 Depress cannon tube within reach. The ammunition team chief removes cover, if present, and muzzle plug (36.1).



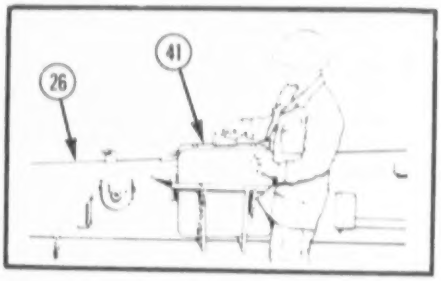
31 Cannoneer no. 3 then disconnects cable assembly (36.2) from vehicular taillight (36.3) and then removes vehicular taillight from cannon tube (36.4) if installed.



32 The assistant gunner then elevates cannon tube (p 2-2) to approximately 300 mils (or another elevation dictated by unit SOP) by turning elevating handwheel (40).

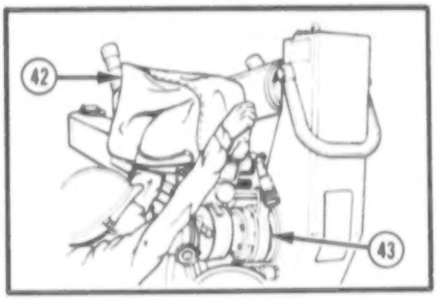


33 The gunner removes fire control equipment carrying case (41) from left trail (26).



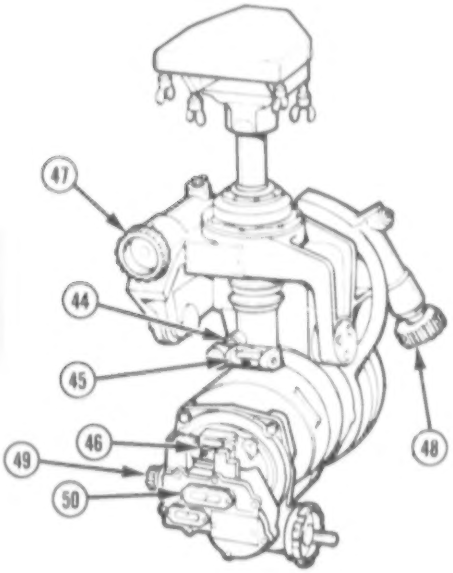
EMPLACING HOWITZER—Continued

34 The gunner removes telescope and mount cover (42) from M171 telescope and quadrant mount (43).



WARNING

When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.



35 The gunner levels M171 telescope and quadrant mount as follows:

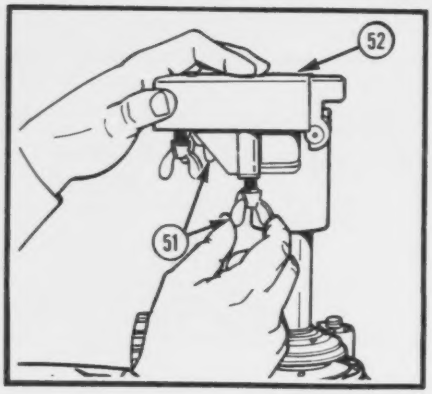
a. Roll back the protective covers on the cross level vial (44), pitch level vial (45), and elevation level vial (46).

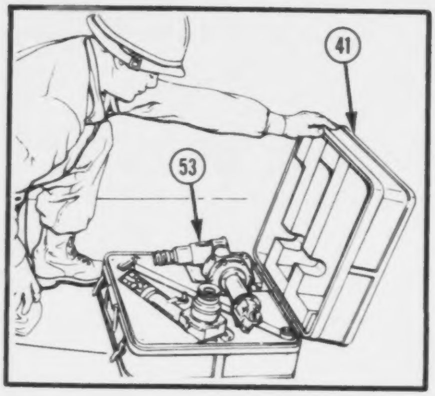
b. Turn cross level control knob (47) to center bubble in cross level vial (44).

c. Turn pitch level control knob (48) to center bubble in pitch level vial (45).

d. Turn elevation correction knob (49) to zero elevation correction counter (50).

EMPLACING HOWITZER—Continued





36 Loosen two wing nuts (51), remove protective cover (52), open carrying case (41) and stow protective cover in carrying case.

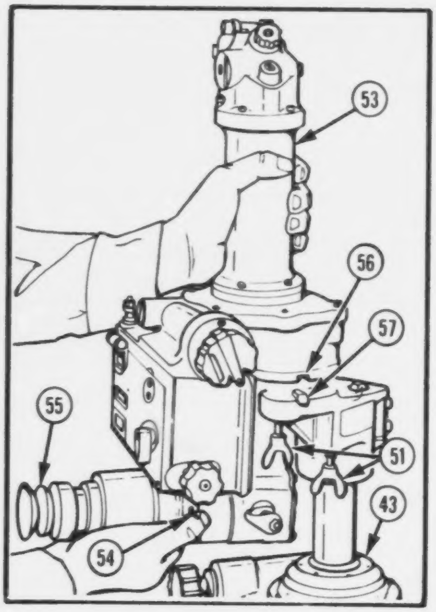
37 The gunner removes pantel (53) from carrying case (41) and then installs pantel as follows:

a. Deleted.

b. Depress locking pin (54) of eyepiece (55). Swing eyepiece and lock in position, approximately 90 degrees to telescope pantel.

c. Aline keyways (56) on each side of pantel (53) with alinement keys (57) on each side of M171 telescope and quadrant mount (43). Seat telescope on mount.

d. Tighten wing nuts (51) to secure pantel (53) on M171 telescope and quadrant mount (43).



CAUTION

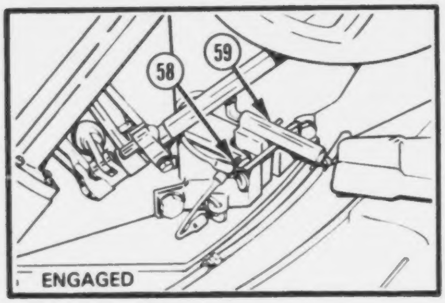
Do not use the firing baseplate and detent assembly as a speed shift assembly.

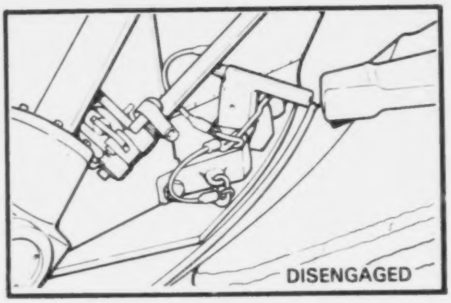
NOTE

Trails may be shifted before howitzer is lowered onto firing baseplate.

38 The gunner obtains initial reading from aiming circle (p 2-68). If reading from aiming circle differs more than 10 mils, the gunner then directs the crew to shift trails until readings between pantel and aiming circle are less than 10 mils. All crewmen lift both trails and shift them to the desired position.

EMPLACING HOWITZER—Continued





CAUTION

Do NOT traverse the top carriage unless the wheels are locked in the up (firing) or down (towed) position.

39 The gunner removes retaining pin (58) from top carriage locking pin (59), pulls up on top carriage locking pin to the disengaged (up) position and secures top carriage locking pin with retaining pin.

NOTE

The howitzer may be laid at this time. Unit SOP will dictate. Laying instructions begin on page 2-68.

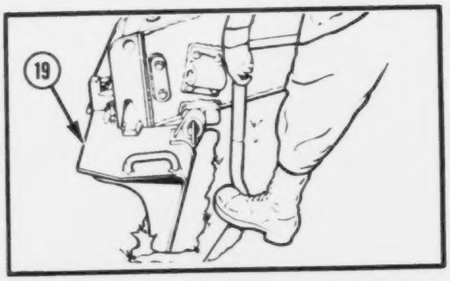
CAUTION

Spades must be dug in a minimum of 6 inches (15.24 cm). Dirt must not be removed from rear of spade.

NOTE

If ground is hard, remove trail locking plugs, insert handling bar into socket on trail with spade installed, slide trail in the width of spade, dig hole, slide trail back into hole, and reinstall trail locking plugs.

40 Cannoneer no. 4 digs in right spade (19) while cannoneer no. 3 digs in left spade.



41 Deleted.

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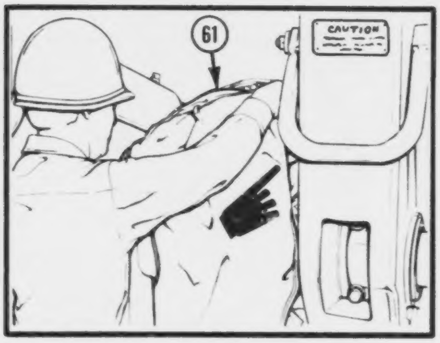
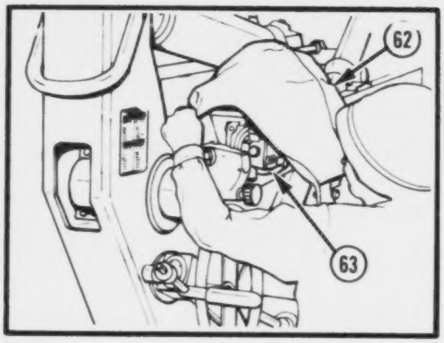
EMPLACING HOWITZER—Continued





42 Cannoneer no. 1 removes breech cover (61).

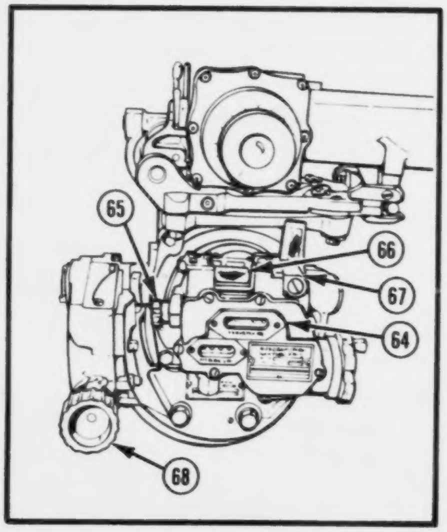
43 The assistant gunner removes telescope and mount cover (62) from M172 telescope and quadrant mount (63).

44 The assistant gunner levels M172 telescope and quadrant mount as follows:

a. Zero elevation correction counter (64) by turning elevation correction knob (65).

b. Roll back protective covers on elevation level vial (66) and cross level vial (67).

c. To center bubble in cross level vial (67), turn cross level control knob (68).

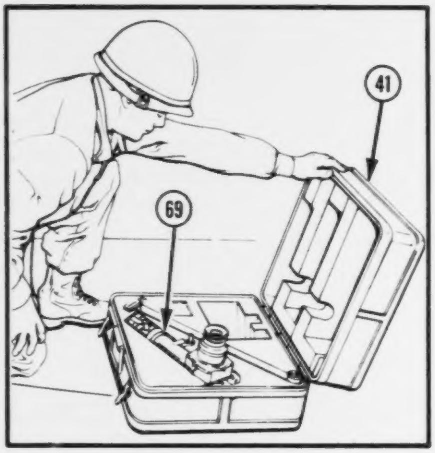


NOTE

Each time weapon is traversed, elevated, or depressed, M172 telescope and quadrant mount must be checked to make sure it is level.

EMPLACING HOWITZER—Continued

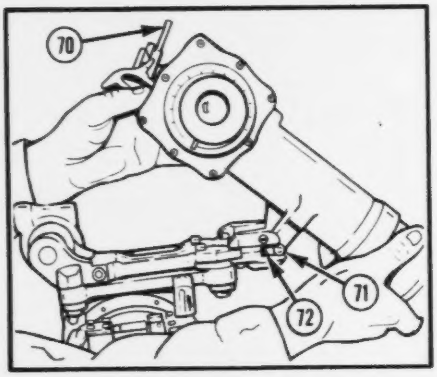
45 The assistant gunner removes M138 elbow telescope (69) from fire control equipment carrying case (41).



46 The assistant gunner installs elbow telescope as follows:

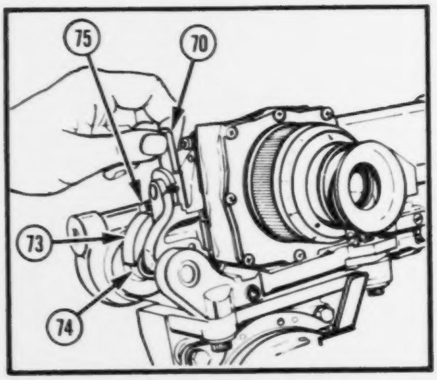
a. Push down on locking latch (70).

b. Insert telescope T-rod (71) into keyway (72) on M172 telescope and quadrant mount with eyepiece end raised.



c. Lower eyepiece end of telescope until latch assembly (73) engages mount shaft (74).

d. Pull locking latch (70) up to a vertical position and turn lock-release lever (75) clockwise until snug.

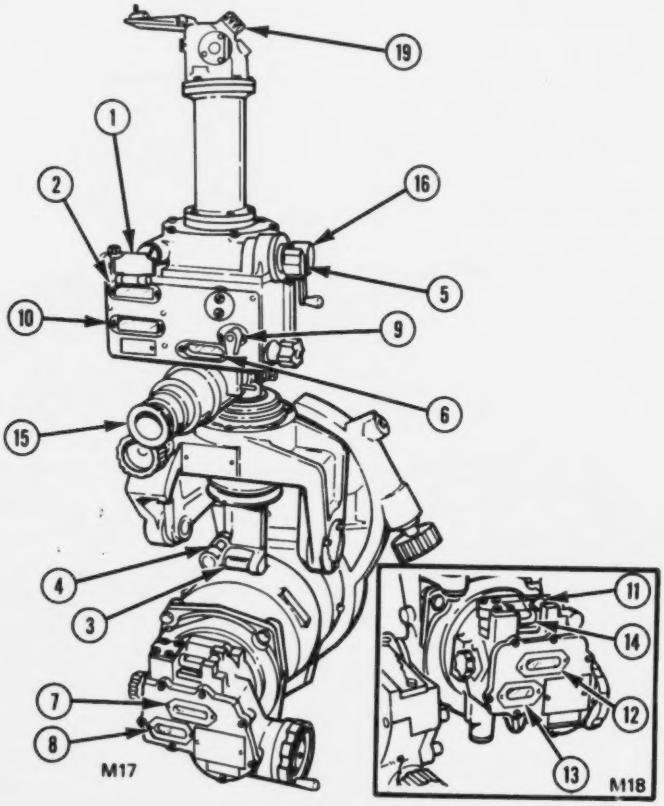


EMPLACING HOWITZER—Continued

47 Deleted.

48 Cannoneer no. 1 gets swab and bucket of water.

LAYING THE HOWITZER, USING M2 AIMING CIRCLE


19
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M17
M18

LAYING THE HOWITZER, USING M2 AIMING CIRCLE—Continued

WARNING

When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

NOTE

Laying the howitzer is accomplished under the direction of the gunnery sergeant when he announces, BATTERY ADJUST, AIMING POINT THIS INSTRUMENT.

1 Upon the command, ADJUST, the gunner lifts door (1) which covers azimuth counter (2) on pantel.

2 The gunner checks to ensure that:

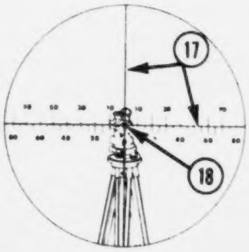
- a. Bubbles in pitch level vial (3) and cross level vial (4) on M171 telescope and quadrant mount are centered.
- b. Azimuth knob bar (5) reads INDIRECT.
- c. Correction counter (6) on pantel is set at zero.
- d. M17 fire control quadrant elevation correction counter (7) is set at zero.
- e. M17 fire control quadrant elevation counter (8) is set at zero.
- f. The gunner engages deflection clutch (9), sets deflection counter (10) at 3200, and then disengages deflection clutch.

3 The assistant gunner checks M18 fire control quadrant to ensure that:

- a. Cross level vial (11) is centered.
- b. Elevation correction counter (12) is set at zero.
- c. Elevation counter (13) is set at elevation dictated by unit SOP.

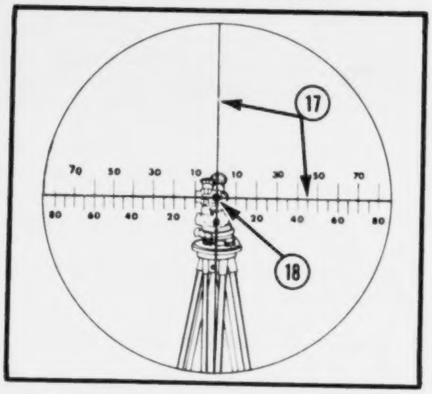
4 The assistant gunner depresses or elevates cannon tube (p 2-2) by operating elevating handwheel until bubble centers in M18 fire control quadrant elevation level vial (14). (Lay at elevation dictated by unit SOP.)

5 Sighting through eyepiece (15), the gunner rotates head of pantel by turning azimuth knob (16) until pantel crosshairs (17) are centered on reflector (18) of aiming circle. Pantel horizontal crosshair alinement is obtained by turning elevation knob (19).



LAYING THE HOWITZER, USING M2 AIMING CIRCLE—Continued

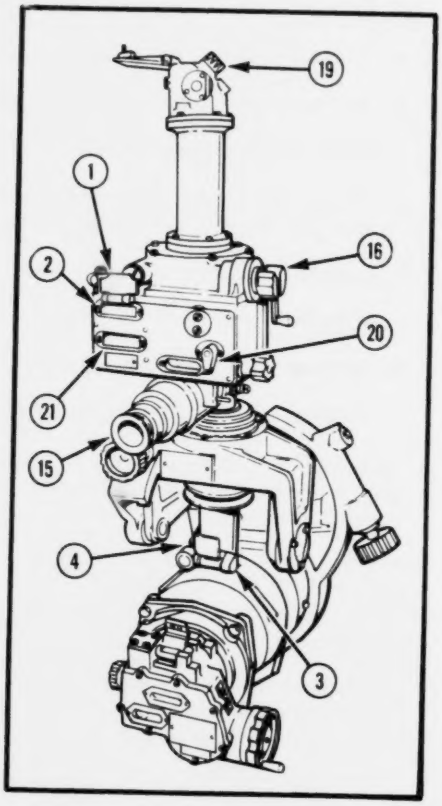
6 When pantel crosshairs (17) are alined on reflector (18) of aiming circle, the gunner announces to the gunnery sergeant, NUMBER (SO-AND-SO), AIMING POINT IDENTIFIED.



7 The gunnery sergeant determines the aiming circle reading to pantel and announces, NUMBER (SO-AND-SO), DEFLECTION (SO MUCH).

8 Upon announcement of the azimuth, the gunner repeats the deflection reading to the gunnery sergeant by announcing, NUMBER (SO-AND-SO), DEFLECTION (SO MUCH), and turns azimuth knob (16) until the announced azimuth appears on azimuth counter (2).

9 Operating traversing handwheel and sighting through eyepiece (15), the gunner traverses howitzer until pantel crosshairs (17) are centered on reflector (18) of aiming circle with bubbles centered in pitch level vial (3) and cross level vial (4). Horizontal crosshair alinement is obtained by turning elevation knob (19).



LAYING THE HOWITZER, USING M2 AIMING CIRCLE—Continued

10 The gunner announces to the gunnery sergeant, NUMBER (SO-AND-SO), READY FOR RECHECK.

11 The gunnery sergeant determines a new aiming circle reading to pantel and announces, NUMBER (SO-AND-SO), DEFLECTION (SO MUCH).

12 Upon announcement of the new azimuth, the gunner repeats the deflection reading and the difference between the new deflection reading and the reading on azimuth counter (2) to the gunnery sergeant by saying, NUMBER (SO-AND-SO), DEFLECTION (SO MUCH), (SO MANY) MILS.

13 The gunner then turns azimuth knob (16) until the new deflection appears on azimuth counter (2).

14 Operating traversing handwheel and sighting through eyepiece (15), the gunner traverses howitzer until pantel crosshairs are centered on the reflector of aiming circle with bubbles centered in pitch level vial (3) and cross level vial (4). Horizontal crosshair alinement is obtained by turning elevation knob (19).

15 The gunner and gunnery sergeant repeat steps 10 thru 14 above until the difference between the announced aiming circle reading to pantel and the reading on azimuth counter (2) (step 12) is 0 mils. When the difference announced by the gunner in step 12 is 0 mils, the gunnery sergeant announces, NUMBER (SO-AND-SO) IS LAID.

WARNING
Position of M171 telescope and quadrant mount and cannon tube must not be disturbed until M1A1 collimator and/or aiming posts have been emplaced.

16 Upon command, LAID, the gunner records reading on azimuth counter (2) and closes door (1) over azimuth counter. The gunner then lays collimator (p 2-72).

EMPLACING M1A1 COLLIMATOR

WARNING

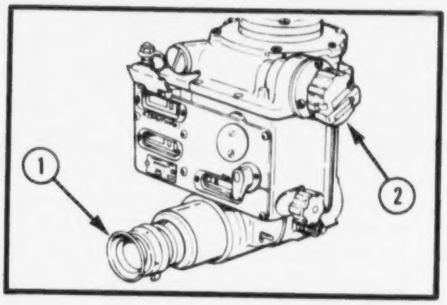
When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

NOTE

Collimator emplacement is performed immediately following laying operations.

The collimator is the primary reference aiming point for the M198 howitzer. The collimator is normally placed on left rear side of weapon to facilitate its maximum use. Emplacement distances away from weapon will vary due to type of terrain but must be between 4 and 15 meters. Optimum distance is between 5 to 12 meters. The collimator should not be emplaced more than 4 meters above or below pantel.

1 Sighting through eyepiece (1), the gunner turns azimuth knob (2) until a convenient place to locate collimator is sighted.



WARNING

The collimator is radioactively illuminated and should be checked before using for illumination in a dim light. If not illuminated, follow radioactive materials procedures listed in the front of this manual.

NOTE

(Deleted)

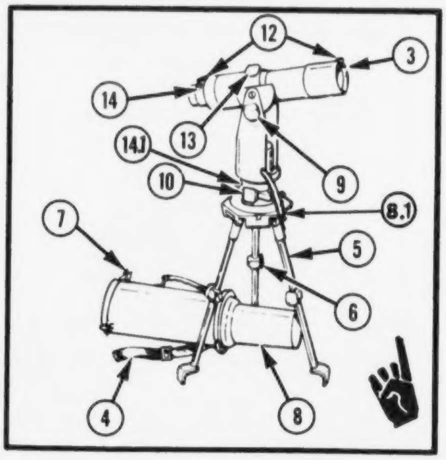
2 Under directions from the gunner, collimator (3) is emplaced by cannoneer no. 2 as follows:

a. Unfasten strap (4) which retains legs.

b. Extend legs (5) as necessary. Lock by tightening locking knobs (6).

c. Rotate legs (5) to the down position. Point one leg toward the pantel. Set each leg firmly into the ground and place a sandbag on each leg.

d. Release latches (7) that retain cover (8). Remove cover from collimator and place between collimator legs with closed end toward muzzle.

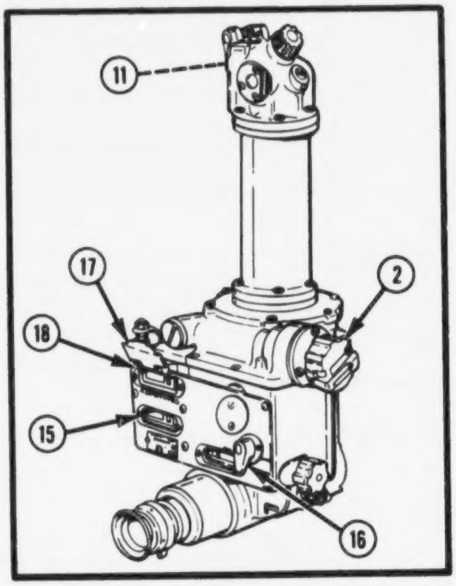


EMPLACING M1A1 COLLIMATOR—Continued

e. Unfasten strap (8.1). Loosen elevation clamping knob (9) and rotate collimator (3) to a horizontal position.

f. Ensure azimuth adjustment is in center of traversing capabilities by operating azimuth adjustment knob (14.1).

NOTE
During night operation, pantel objective lens (11) may not be visible from collimator. To increase visibility, place green aiming post light to pantel eyepiece.

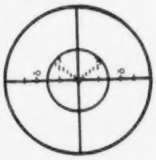


g. Loosen azimuth clamping knob (10). Sighting down front and rear sights (12), rough lay collimator on pantel objective lens (11). Tighten elevation clamping knob (9) and azimuth clamping knob (10).

h. Loosen cross level clamping knob (13). Rotate collimator (3) until bubble of cross level vial (14) centers. Tighten cross level clamping knob.

NOTE
To ensure accurate laying and referring, the gunner, when sighting through pantel, should view a minimum of 11 mils of collimator reticle area.

3 Sighting through pantel, the gunner turns azimuth knob (2), commands cannoneer no. 2 to turn azimuth adjustment knob (14.1) until pantel crosshairs are centered with collimator reticle center, and announces to cannoneer no. 2, SET.



4 With collimator emplaced, the gunner engages deflection counter (15) by turning deflection clutch (16) counterclockwise to the ENGAGE position.

5 The gunner lifts azimuth counter door (17), records the value appearing on azimuth counter (18), and closes azimuth counter door.

EMPLACING M1A2 AIMING POSTS

WARNING

(Deleted)

NOTE

The M1A2 aiming posts are the alternate aiming reference for the M198 howitzer and are emplaced, time permitting, immediately following emplacement of collimator.

1 With howitzer laid on initial azimuth of fire, the gunner checks to ensure that:

a. Pantel pitch and cross level vial bubbles are centered.

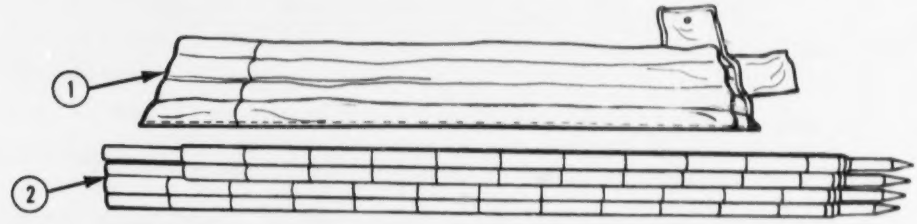
b. Pantel correction counter is set at zero.

2 Deleted.

NOTE

Two aiming posts are used for each howitzer. To ensure equal spacing of aiming posts, the distance from howitzer should be paced by the same cannoneer.

3 Cannoneer no. 5 emplaces aiming posts as follows:



a. Remove aiming post cover (1) and aiming posts (2) from stowage brackets on right trail.

b. Remove aiming posts (2) from cover and assemble.

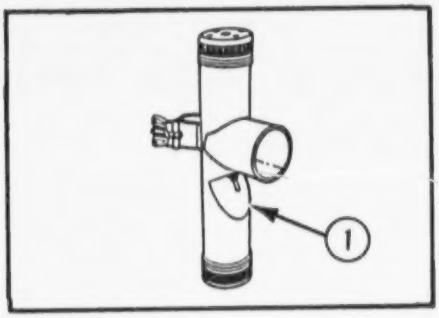
WARNING

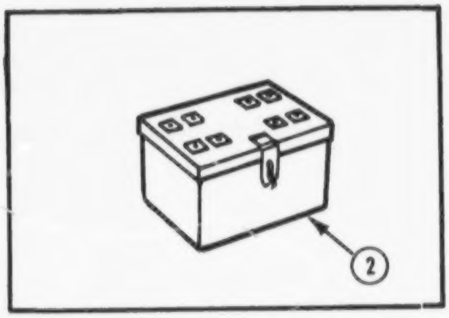
(Deleted)

NOTE

Unit SOP should state which light will be used on near post and which will be used on far post and instructions for aiming post location.

EMPLACING M1A2 AIMING POSTS—Continued

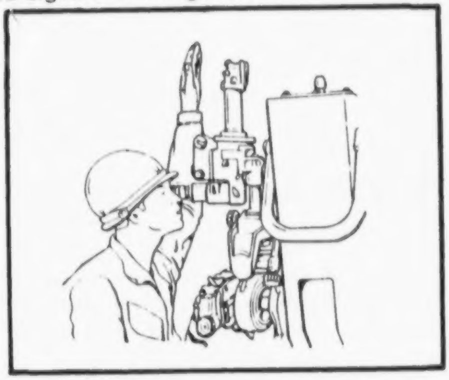




c. At night, remove M14 aiming post lights (1) from M14 chest (2) and install on aiming posts.

4 Cannoneer no. 5 runs out approximately 50 meters with both aiming posts and sticks the near post (short post) in the ground. He continues an additional 50 meters, stops and faces the gunner, and emplaces the far aiming post (long post) alined with the body. Cannoneer returns to the near aiming post and positions it by observing hand signals of the gunner.

5 Sighting through pantel, the gunner positions the aiming post by extending his left hand above his head (right hand if posts are to rear of weapon) and having the cannoneer move the post as directed by the following movements:



a. Move aiming post left or right as directed by direction of hand movement.

b. Up and down movement represents emplace.

c. Clenched fist represents stop.

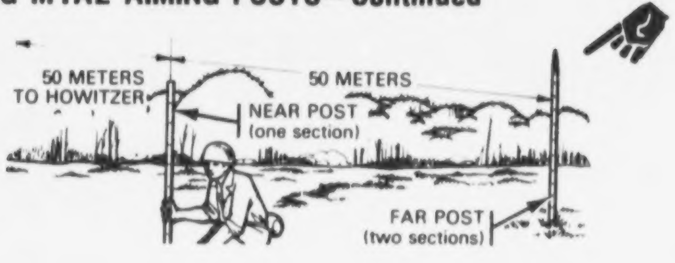
d. Tapping on top of helmet and moving hand (left or right) represents movement of top of aiming post.

e. Hand waved in a circular motion means for cannoneer to come in.

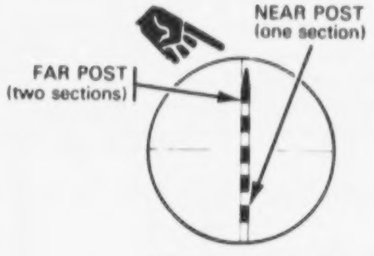
NOTE

At night, this method can be used with a flashlight in the on/off mode.

EMPLACING M1A2 AIMING POSTS—Continued



6 After aiming posts are emplaced, sight picture should be as illustrated (no displacement). The gunner then records the value indicated on azimuth counter.



NO DISPLACEMENT

MEASURE SIGHT-TO-CREST

1 The chief of section sights along the lowest element of the tube and directs the gunner to traverse left or right and the assistant gunner to elevate or depress the tube until the lowest element of the tube just clears the highest crest in the field of fire.

2 The chief of section directs the assistant gunner to MEASURE THE QUADRANT.

3 The assistant gunner centers the cross level bubble by turning the cross level control knob, centers the elevation level bubble by turning the elevation control knob, and reports the reading that appears on the elevation counter.

NOTE

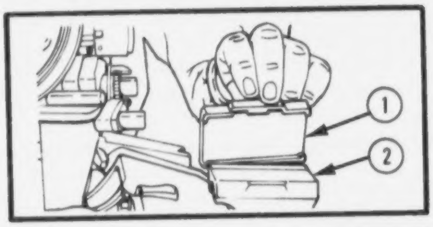
The quadrant can also be measured using the gunner's quadrant by placing the gunner's quadrant on the M18 fire control quadrant seats with the LINE-OF-FIRE arrow pointing toward the muzzle, moving radial arm index up or down and turning the micrometer knob until the bubble centers.

CHECKING ALINEMENT OF M137 PANTEL, USING M139 ALINEMENT DEVICE

WARNING

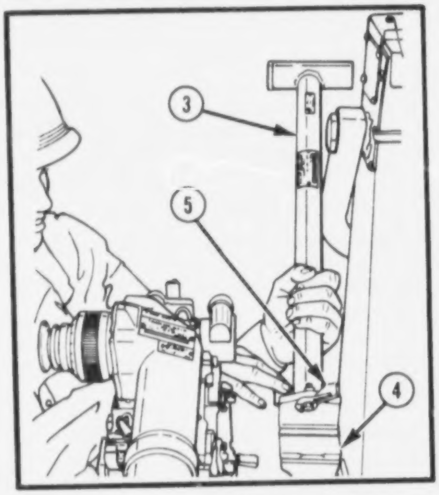
When using radioactively illuminated fire control equipment, follow radiation procedures in the front of this manual.

1 The assistant gunner removes protective cover (1) from dovetail (2) on right trunnion and ensures dovetail is clean by wiping with a clean rag (item 13, app D).

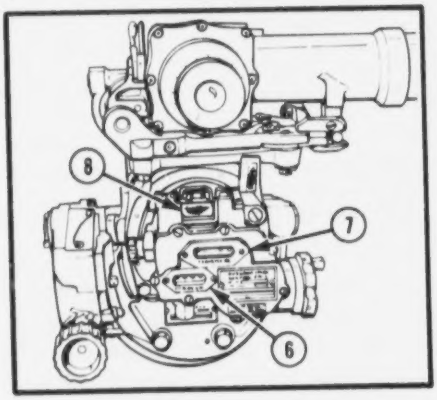


2 The assistant gunner removes alinement device (3) from carrying case and ensures mating surface (4) is clean by wiping mating surface with a clean rag (item 13, app D). Remove protective plastic caps from head of alinement device and store in carrying case.

3 The assistant gunner mates alinement device (3) to dovetail of mounting bracket, ensuring mating surface of alinement device fits dovetail. Then the assistant gunner turns alinement device latch (5) to lock device in place.



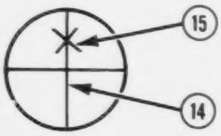
4 The assistant gunner sets M18 fire control quadrant elevation counter (6) at 0000 and elevation correction counter (7) at 00. The assistant gunner levels cannon tube by turning elevating handwheel (p 2-2) until bubble in elevation level vial (8) centers.



CHECKING ALINEMENT OF M137 PANTEL, USING M139 ALINEMENT DEVICE—Continued

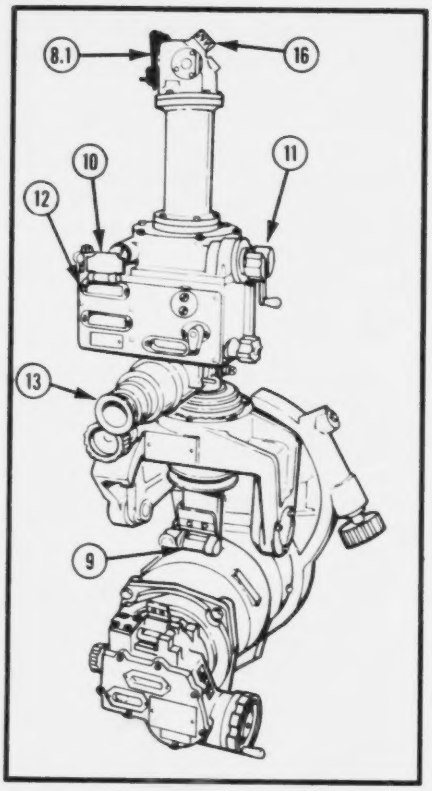
5 The gunner levels M171 telescope and quadrant mount (p 2-63) and closes parallax shield (8.1). After leveling mount, the gunner ensures that bubble in pitch level vial (9) remains centered until alinement check of pantel is complete.

6 The gunner lifts azimuth counter door (10) and turns azimuth knob (11) until a 4800-mil reading is obtained on azimuth counter (12).



7 The gunner sights through eyepiece (13). The vertical pantel azimuth crosshair (14) should aline with crosshairs (15) of alinement device.

NOTE
To center crosshair for elevation, turn elevation knob (16).



8 If pantel crosshair does not aline with alinement device crosshairs when azimuth counter (12) reads 4800 mils ±0.5, the assistant gunner proceeds as follows:

a. Remove alinement device from dovetail.

b. Reclean surfaces and reinstall alinement device. If pantel crosshair does not aline, get another alinement device and recheck alinement.

c. If alinement is still not obtained, notify organizational maintenance.

CAUTION
Failure to remove alinement device during firing may damage device.

8.1 The gunner opens the parallax shield (8.1) and closes azimuth counter door.

9 The assistant gunner removes and stores alinement device.

CHECKING ALINEMENT OF M137 PANTEL, USING M139 ALINEMENT DEVICE—Continued

CAUTION

Failure to install protective cover on dovetail may result in damage to dovetail.

10 The assistant gunner installs protective cover.

BORESIGHTING M138 ELBOW TELESCOPE, USING DISTANT AIMING POINT

WARNING

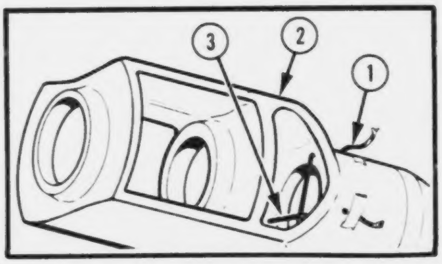
When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

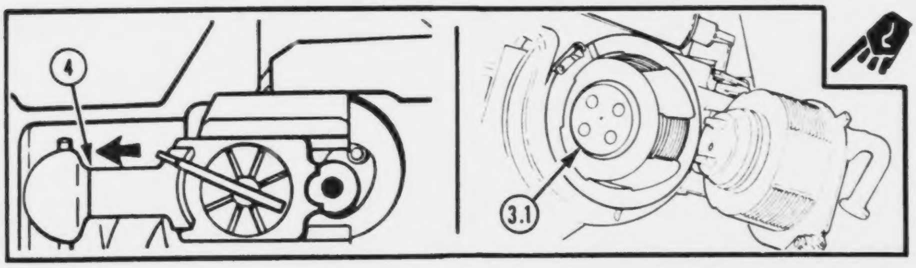
NOTE

Boresighting of M138 elbow telescope is not mandatory upon occupation of new position area, but should be accomplished as soon as time permits. The elbow telescope and M172 telescope and quadrant mount are designed to reduce necessity of boresighting after telescope installation and removal. Boresighting of elbow telescope is accomplished by the distant aiming point method.

1 The assistant gunner cross-levels M172 telescope and quadrant mount by centering bubble in cross level vial on M18 fire control quadrant.

2 The assistant gunner stretches a cord (item 7, app D) (1) tightly through drilled holes in muzzle brake (2) and fastens it in place, forming muzzle boresights (3).

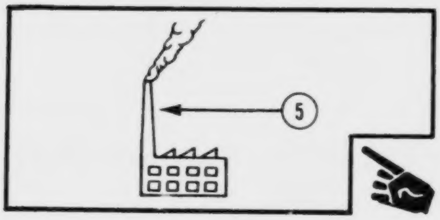




3 Cannoneer no. 1 opens breech and installs breech boresight disk (3.1). If disk is not available, cannoneer no. 1 slides firing mechanism block assembly (4) left to the open position.

BORESIGHTING M138 ELBOW TELESCOPE, USING DISTANT AIMING POINT—Continued

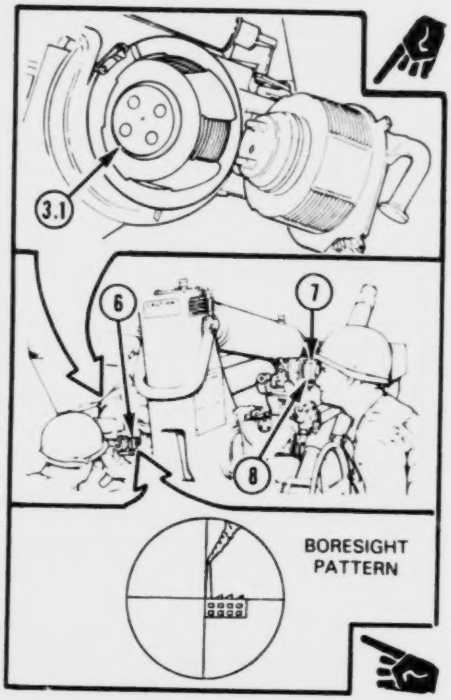
4 The chief of section selects a distant aiming point (5) with a well defined vertical and horizontal axis, ideally at least 1500 meters from the weapon. If such an aiming point is not available, the chief of section boresights at engagement range for direct fire.



5 The chief of section, looking through boresight disk (3.1) (or primer cavity (6)) directs the elevation, depression, or traversing of cannon tube (p 2-2) until muzzle boresights are alined on distant aiming point.

NOTE

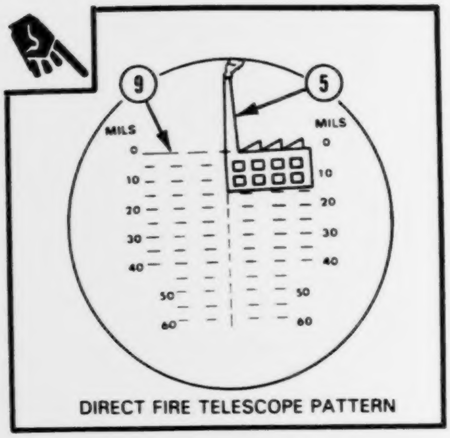
If breech boresight disk is not available, perform step 6. If breech boresight disk is available, proceed to step 7.



6 The assistant gunner, looking through eyepiece (7), adjusts diopter scale (8). Using a calibrated gunner's quadrant and the quadrant seats on the M172 telescope and quadrant mount, the assistant gunner measures the elevation to the distant aiming point and elevates the muzzle 2.3 mils. The assistant gunner checks cross level of the M172 telescope and quadrant mount and adjusts if necessary.

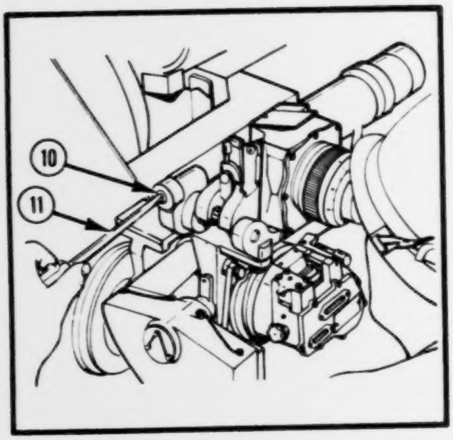
BORESIGHTING M138 ELBOW TELESCOPE, USING DISTANT AIMING POINT—Continued

7 The assistant gunner sights through eyepiece (7). If elevation line (9) is alined with distant aiming point (5), elbow telescope is in boresight.



DIRECT FIRE TELESCOPE PATTERN

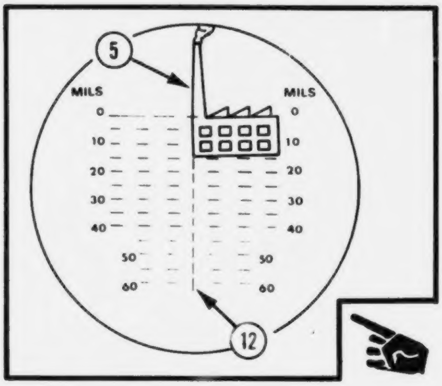
8 If elevation line is not alined with distant aiming point, the assistant gunner turns elevation adjusting screw (10) with screwdriver (11) or coin until alined. If elevation line is misalined by more than 5 mils, repeat steps 1 thru 7 prior to adjustment.



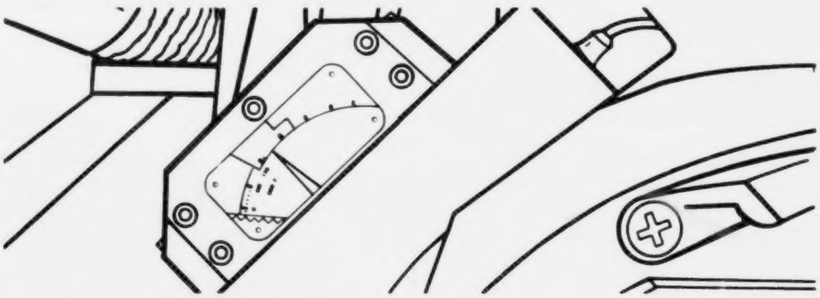
BORESIGHTING M138 ELBOW TELESCOPE, USING DISTANT AIMING POINT—Continued

9 The vertical reticle line (12) should be on distant aiming point (5). If line is not in alinement, repeat steps 1 thru 7. If azimuth correction is still required, notify organizational maintenance.

10 The assistant gunner removes cord from muzzle brake; cannoneer no. 1 removes breech boresight disk, if installed.



USING THE THERMAL WARNING DEVICE



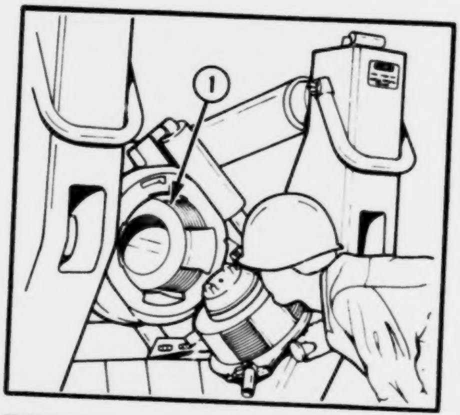
The thermal warning device shows the temperature of the cannon tube so that you may take the proper action in the event of a misfire or checkfire. Use the chart below as a guide.

Temperature/Color code	Tube condition	Crew must do the following
0° to +170°F (−17° to +77°C)/Green	Cold	In case of misfire or checkfire, go to page 4-42.
+170° to +350°F (+77° to +177°C)/Yellow	Warm	Notify fire direction center that cannon tube is warm. In case of misfire or checkfire, go to page 4-43.
Above +350°F (+177°C)/Red	Hot	Fire combat emergency missions only. In case of misfire or checkfire, go to page 4-44.1.

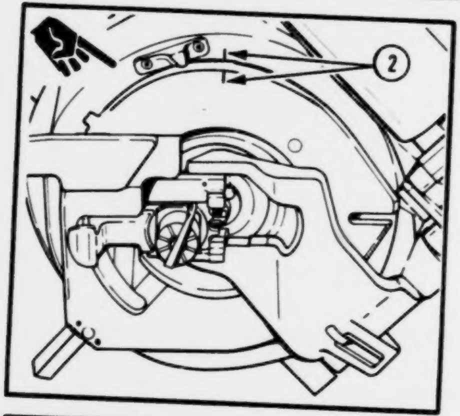
PREFIRING CHECKS

The following checks must be made prior to firing of the first round after a move is made.

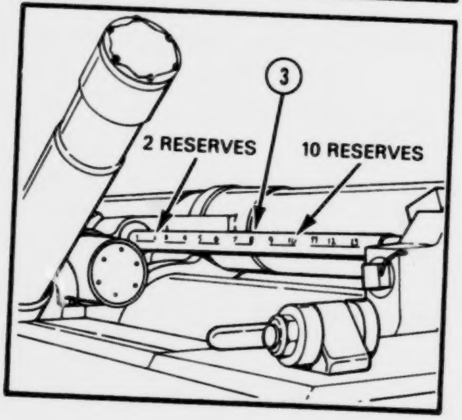
1 Cannoneer no. 1 looks through cannon tube (1) to ensure no foreign matter is present.



2 Cannoneer no. 1 ensures witness marks (2) are alined.



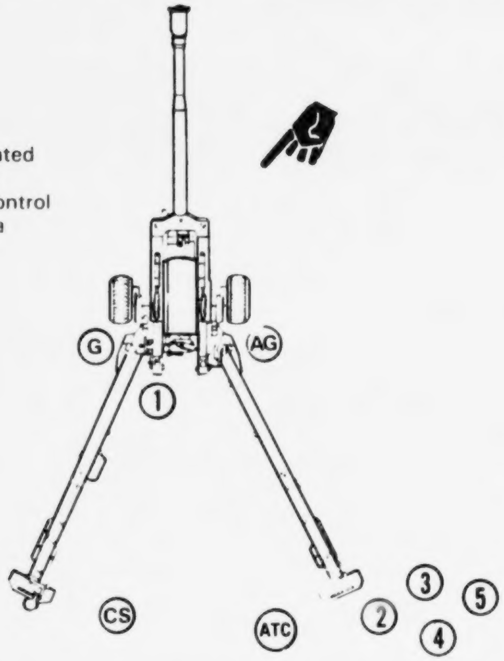
3 The assistant gunner checks to see if oil reserve indicator (3) shows between two and 10 reserves.



*LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS

NOTE

To be sure backlash is eliminated when laying for direction and elevation, last motion of all control and leveling knobs will be in a clockwise direction.



1 At the command, FIRE MISSION, from the chief of section, the section takes positions as shown above. The chief of section then relays the fire mission to the crew.

WARNING

Prior to loading howitzer for actual firing, all personnel must be familiar with prescribed actions in the event of a misfire (p 4-40) and ensure prefiring checks (p 2-82) are performed.

CAUTION

Do not fire weapon when speed shift assembly is supporting howitzer.

2 Cannoneer no. 4 repeats PROJECTILE, and selects and prepares projectile (p 4-23). (For preparation of M712 projectile (Copperhead), see p 4-51).

3 Cannoneer no. 3 repeats PROPELLING CHARGE, and selects and prepares propelling charge (p 4-22).

4 Cannoneer no. 2 repeats FUZE, and selects and prepares fuze (p 4-26).

5 Cannoneer no. 1 opens breechblock assembly (p 2-1).

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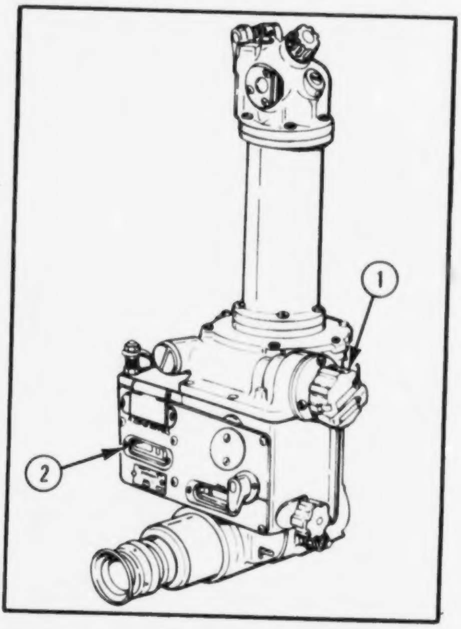
*Procedures for firing drills have been standardized under the Department of the Army Standardization Program.

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

WARNING

☢ When using radioactively illuminated fire control equipment, follow radiation procedures in the front of this manual.



6 The gunner lays for direction as follows:

NOTE

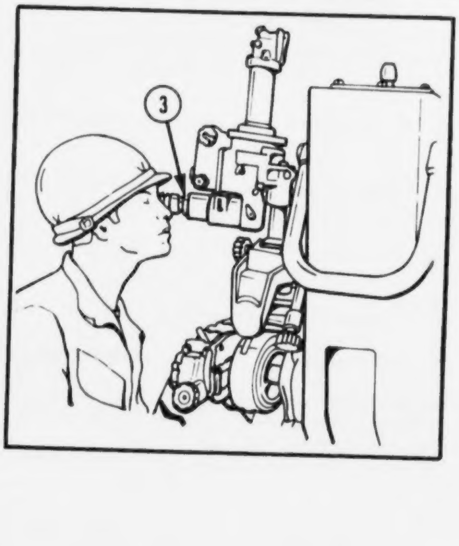
If a collimator is used, the gunner performs the following:

a. On the command, DEFLECTION (SO MUCH), the gunner turns azimuth knob (1) until deflection appears in deflection counter (2). He then reads the setting to the chief of section.

NOTE

Each time howitzer is traversed or cannon is elevated or depressed, telescope and quadrant mount must be leveled.

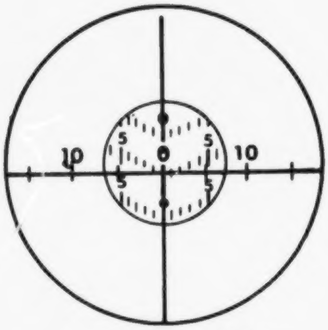
b. While sighting through eyepiece (3), the gunner traverses weapon until a proper sight picture on collimator is obtained.



c. The gunner then levels M171 telescope and quadrant mount (p 2-63) and rechecks sight picture.

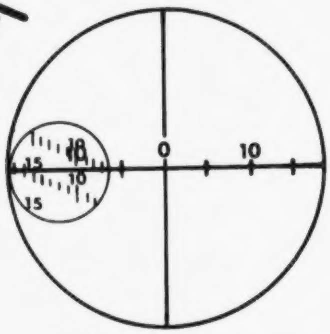
LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

d. If the weapon has experienced no displacement, the sight picture will appear as shown.



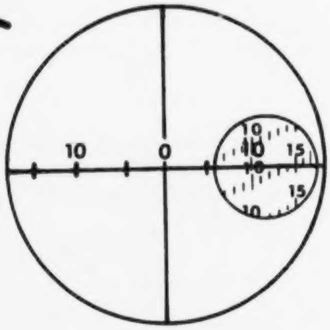
NO DISPLACEMENT

e. If the weapon has experienced right displacement (collimator reticle pattern slopes upward to the left), the gunner traverses the weapon until the left portion of the pantel reticle is matched with the collimator reticle. For example, the 10- and 15-mil marks are alined as shown.



RIGHT DISPLACEMENT

f. If the weapon has experienced left displacement (collimator reticle pattern slopes upward to the right), the gunner traverses the weapon until the right portion of the pantel reticle is matched with the collimator reticle. For example, the 10- and 15-mil marks are alined as shown.



LEFT DISPLACEMENT

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

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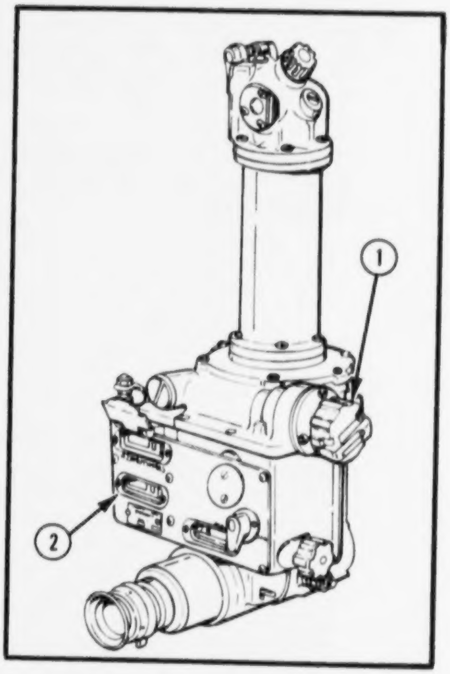
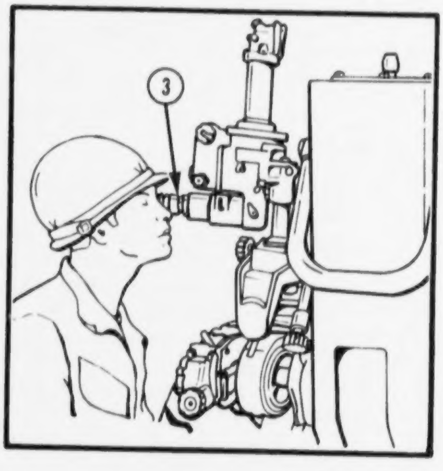


NOTE

If aiming posts are used, the gunner performs the following:

h. On the command, DEFLECTION (SO MUCH), the gunner turns azimuth knob (1) until deflection appears in deflection counter (2). He then reads the setting to the chief of section.



i. While sighting through eyepiece (3), the gunner traverses weapon until a proper sight picture on aiming posts is obtained.

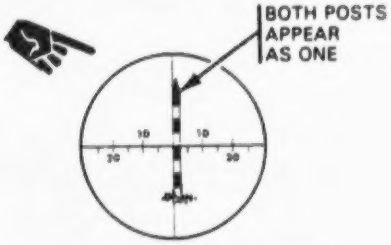
j. The gunner then levels M171 telescope and quadrant mount (p 2-63) and rechecks sight picture.

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

NOTE

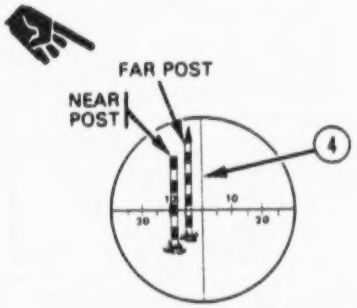
At night aiming posts are identified as near or far by color of aiming post lights. Unit SOP will dictate which color goes on which aiming post.

k. If the weapon has experienced no displacement, the sight picture will appear as shown.



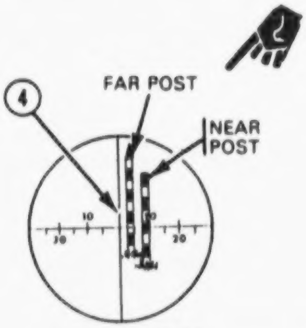
NO DISPLACEMENT

l. If the weapon has experienced right displacement (the far aiming post is to the right of the near aiming post), the gunner traverses the weapon until the far aiming post is exactly halfway between the near aiming post and the pantel vertical reticle line (4) as shown.



CORRECTED FOR RIGHT DISPLACEMENT

m. If the weapon has experienced left displacement (the far aiming post is to the left of the near aiming post), the gunner traverses the weapon until the far aiming post is exactly halfway between the near aiming post and the pantel vertical reticle line (4) as shown.



CORRECTED FOR LEFT DISPLACEMENT

n. The gunner then relevels M171 telescope and quadrant mount (if necessary), rechecks and adjusts sight picture (if necessary) by traversing, and announces READY to the chief of section.

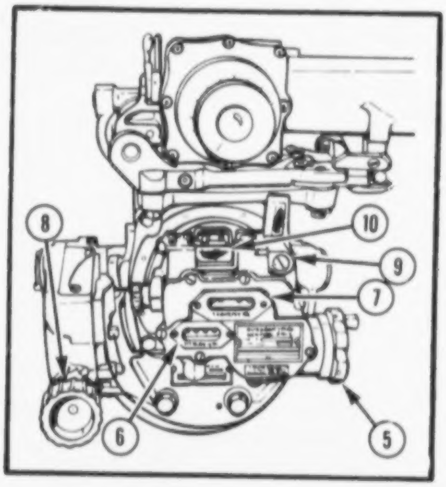
LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

NOTE

During normal operation, the assistant gunner lays the howitzer for elevation using the M18 fire control quadrant. However, during one-man indirect fire operations, the gunner lays the howitzer for elevation using the M17 fire control quadrant.

7 Using the M18 fire control quadrant, the assistant gunner lays the howitzer for elevation as follows:

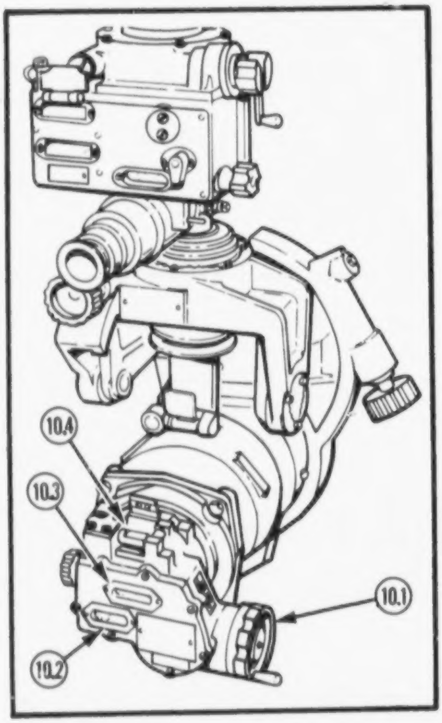
a. On the command, QUADRANT (SO MUCH), the assistant gunner ensures elevation correction counter (7) reads 00 and rotates elevation control knob (5) until announced quadrant appears in the elevation counter (6). He then reads the setting to the chief of section.



b. The assistant gunner elevates or depresses the tube (p. 2-2) until bubble in the elevation level vial (10) centers. The assistant gunner centers the bubble in the cross level vial (9) by turning the cross level control knob (8). The assistant gunner rechecks and adjusts both bubbles (if necessary), and announces SET to the chief of section.

c. The gunner's quadrant can also be used to lay for quadrant. The chief of section sets the announced quadrant on the gunner's quadrant using the radial arm index and micrometer knob. He places and holds the gunner's quadrant firmly on the M18 fire control quadrant seats with the LINE-OF-FIRE arrow pointing toward muzzle. The chief of section directs the assistant gunner to elevate or depress until the bubble is centered.

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

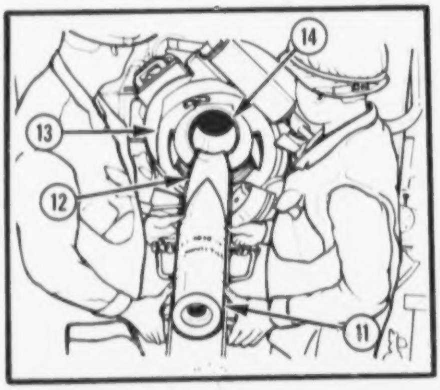


7.1 Using the M17 fire control quadrant (during one-man indirect fire operations) the gunner lays the howitzer for elevation as follows:

a. On the command, QUADRANT (SO MUCH), the gunner ensures elevation correction counter (10.3) reads 00 and rotates elevation control knob (10.1) until announced quadrant appears in elevation counter (10.2). He then reads setting to chief of section.

b. The gunner elevates or depresses cannon tube (p 2-2) until bubble centers in elevation level vial (10.4).

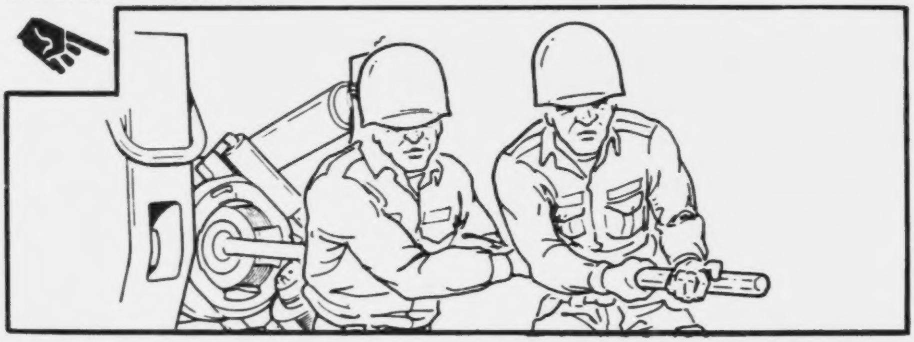
c. The gunner rechecks the M171 telescope and quadrant mount pitch and cross level vials, pantel sight picture, and adjusts as necessary. The gunner then announces READY to the chief of section.



8 Cannoneers no. 4 and 5 place projectile (11) on loading tray (12). They lift upward and place loading tray on breech ring assembly (13) so that front edge of loading tray rests against rear face of cannon tube (14).

NOTE
For M549 projectile, assure cap is removed.

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued



9 Cannoneer no. 1 places loading rammer assembled on staff sections against base of projectile and pushes projectile into breech until the rotating band clears the Swiss notch recess. Cannoneer no. 5 removes loading tray.

NOTE

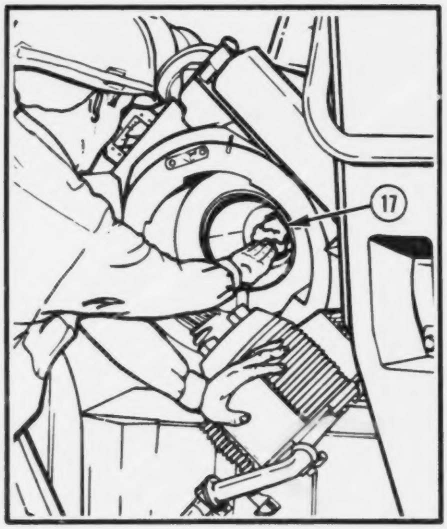
Ramming at low gun elevations will be done using two 4-foot (1.20-m) cleaning staff sections. If the gun is elevated to the extent that two staff sections cause interference with the ground, one staff section may be removed and replaced with a 2-foot (0.60-m) staff section. Do not use only a single staff section or rammers for other weapons.

10 Upon the command, READY, RAM, from cannoneer no. 4, the projectile is rammed into place by cannoneers no. 1 and 4, using loading rammer and staff.

WARNING

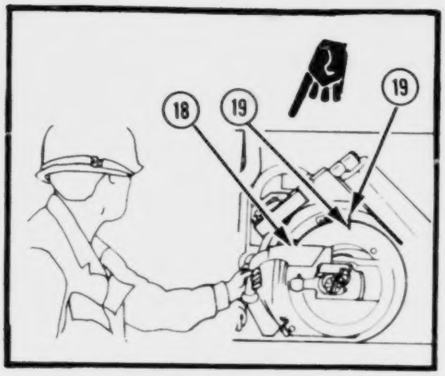
Do not leave a propelling charge in chamber longer than necessary before firing. Temperature changes affect performance characteristics of a powder charge. Those changes occur rapidly in a hot chamber.

11 Cannoneer no. 3 hands prepared propelling charge (17) to cannoneer no. 1 who checks the charge and then announces CHARGE (SUCH-AND-SUCH) to the chief of section. Cannoneer no. 1 then inserts the charge into the chamber with red igniter end to rear. The propelling charge is pushed in until red base is approximately 3 inches (7.62 cm) from rear face of tube into Swiss notch recess.



LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

12 Cannoneer no. 1 closes breechblock assembly (18), making sure it is locked in place and that witness marks (19) are alined.



13 Cannoneer no. 1 inserts primer (20) into primer cavity (21) until it seats against cartridge extractor (22).

NOTE

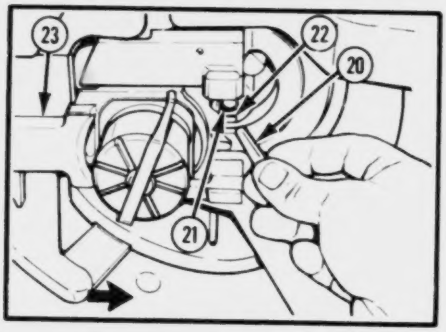
Failure to close breechblock assembly completely may make this operation difficult.

14 Cannoneer no. 1 slides firing mechanism block assembly (23) closed.

15 Deleted.

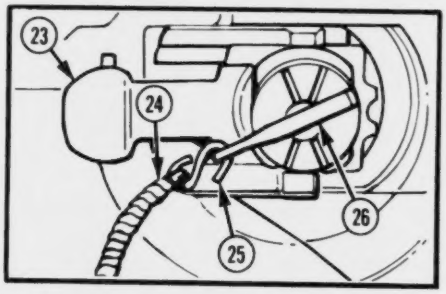
NOTE

The lanyard lever can be repositioned by pushing in on "hole end" of lever and rotating.



16 Cannoneer no. 1 attaches lanyard (24) by inserting S-hook (25) through hole in lanyard lever (26) and announces, PRIMED.

17 Deleted.



WARNING

When firing, personnel in the area will stay clear of the recoil path.

When firing howitzer at night, personnel should avoid direct viewing of muzzle flash from their weapon or adjacent weapons when firing top zones. Temporary flash blindness can be caused by intense muzzle flash, resulting in potential reduction of crew efficiency.

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

WARNING

The M198 howitzer can generate blast overpressure which may damage hearing or cause injury to lungs or sinuses if proper protective measures are not followed. Supervised wearing of earplugs is required at all times, with the e-a-r type (plastic roll) preferred. The effects of blast can be reduced by moving further to the rear of the weapon. For this reason, all crew members not required to fire the weapon should move away as far to the rear as practicable. Any crewman who experiences such problems as shortness of breath or bleeding from nose or mouth must be immediately transported to a medical facility for evaluation.

The degree of hearing protection required is based on propelling charge used and number of rounds fired daily by the crew. For training missions, earplugs provide adequate protection if M4A2 (WB), zone 6, or lower charges are used. When firing higher zones, consult the following chart.

Properly worn foam earplugs provide adequate protection when firing all existing propellant charges, including M203 series, at all quadrant elevations according to the guidelines in the following chart.

Maximum Firings in 24-Hour Period with Hearing Protection Required*

Propellant charge	No. of rounds
M3 series	1,000
M4 series	144
M119 series	32
M203 series	12**

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*These recommended limits are mutually exclusive; e.g., 12 rounds M203 series, or 32 rounds M119 series, or 144 rounds M4 series, or 1000 rounds M3 series per 24 hour continuous time period.

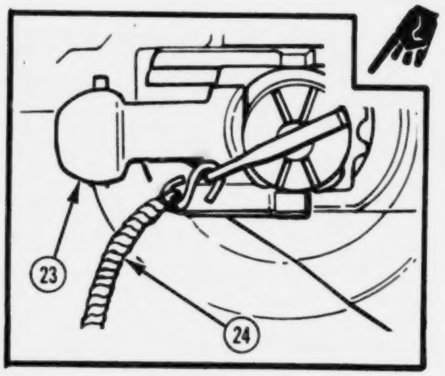
**When firing more than 12 M203 series propellant charges in a 24-hour period, all personnel must stand 25 feet (7.62 m) or more behind rear of cannon and 25-foot (7.62-m) lanyard must be used.

NOTE

When cannoneer no. 1 has announced, PRIMED, the assistant gunner has announced, SET, and the gunner has announced, READY, the chief of section may command, FIRE, unless restricted by the fire command.

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

18 When the chief of section commands, FIRE, or drops raised arm, cannoneer no. 1 pulls lanyard (24) with a steady pull.



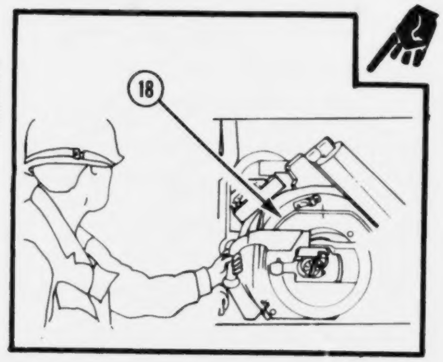
NOTE

The primer is ignited by impact of hammer against firing pin. The firing mechanism block assembly (23) returns automatically to the ready position when lanyard (24) is released.

WARNING

In case of a failure to fire, refer to misfire and checkfire procedures (p 4-40).

19 When cannon tube returns to the in-battery position, cannoneer no. 1 opens breechblock assembly (18) (p 2-1).



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LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued

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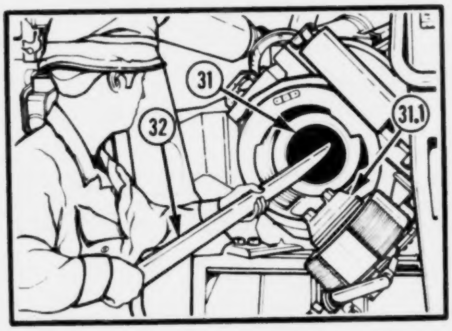
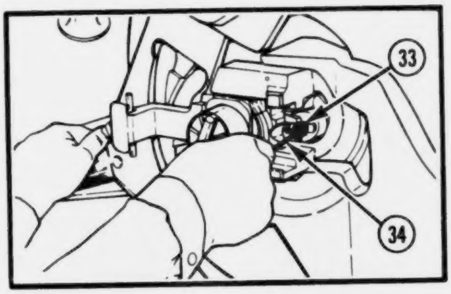
b. Deleted.

c. Deleted.

d. Deleted.

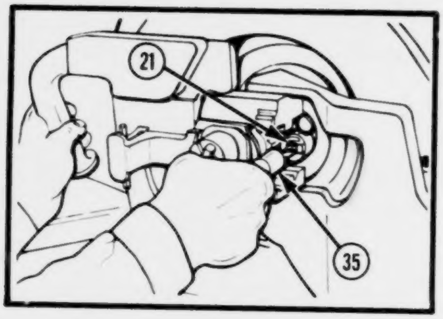


21 Cannoneer no. 1 swabs powder chamber (31), obturator spindle assembly (31.1), and gas check seat using chamber swab (32); inspects cannon tube; and announces, BORE CLEAR.



22 Cannoneer no. 1 cleans vent hole (33) in obturator spindle assembly by pushing vent-cleaning tool (34) through.

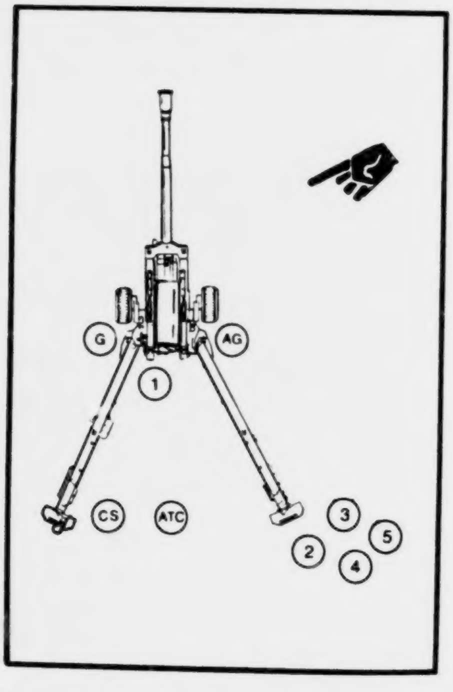
LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING INDIRECT FIRE MISSIONS—Continued



23 Cannoneer no. 1 cleans primer cavity (21) with reaming tool and primer cleaning brush (35), by twisting it clockwise and counterclockwise.

24 Deleted.

* LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING DIRECT FIRE MISSIONS



NOTE
The following procedures are for two-person operations. For one-person, one-sight operations, the gunner assumes duties of the assistant gunner (p 2-53) and performs them on left side of howitzer.

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*Procedures for firing drills have been standardized under the Department of the Army Standardization Program.

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING DIRECT FIRE MISSIONS—Continued

DUTIES OF THE CHIEF OF SECTION

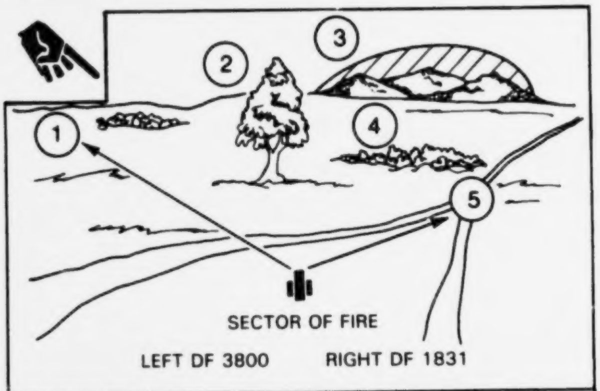
Upon receipt of the order to fire direct fire, the chief of section does the following:

a. Commands the section to take positions as illustrated.

b. Announces target to section, i.e., TARGET, ROCK PILE.

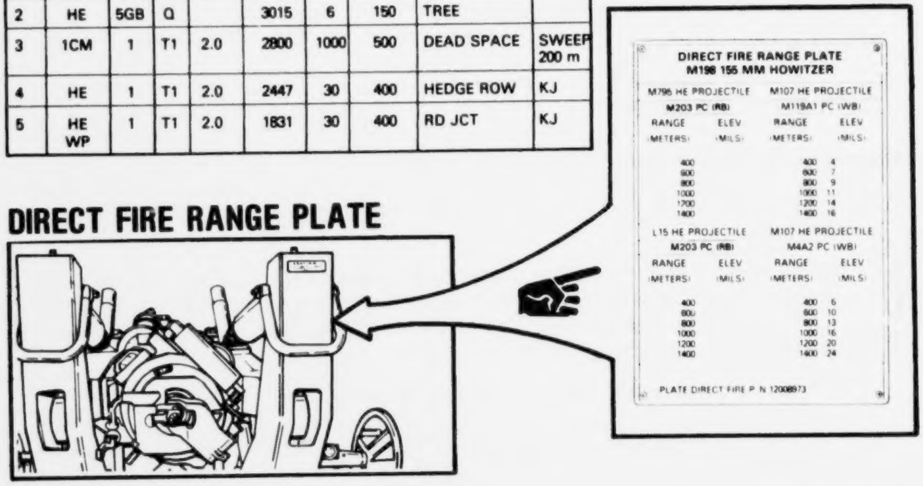
c. Determines quadrant of target from range card, i.e., 4 mils. If range card is not prepared, quadrant may be obtained from direct fire range plate.

RANGE CARD



NO.	SHELL	CHG	FZ	TI	DF	QE	RANGE	DESCRIPTION	RMK
1	HE	7	Q		3800	4	250	ROCK PILE	
2	HE	5GB	Q		3015	6	150	TREE	
3	1CM	1	T1	2.0	2800	1000	500	DEAD SPACE	SWEEP 200 m
4	HE	1	T1	2.0	2447	30	400	HEDGE ROW	KJ
5	HE WP	1	T1	2.0	1831	30	400	RD JCT	KJ

DIRECT FIRE RANGE PLATE



DIRECT FIRE RANGE PLATE
M198 155 MM HOWITZER

M796 HE PROJECTILE
M203 PC (RB)

RANGE (METERS)	ELEV (MILS)
400	
600	
800	
1000	
1700	
1400	

M107 HE PROJECTILE
M119A1 PC (WB)

RANGE (METERS)	ELEV (MILS)
400	4
600	7
800	9
1000	11
1200	14
1400	16

L15 HE PROJECTILE
M203 PC (RB)

RANGE (METERS)	ELEV (MILS)
400	
600	
800	
1000	
1200	
1400	

M107 HE PROJECTILE
M4A2 PC (WB)

RANGE (METERS)	ELEV (MILS)
400	6
600	10
800	13
1000	16
1200	20
1400	24

PLATE DIRECT FIRE P N 12008973

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING DIRECT FIRE MISSIONS—Continued

d. Determines and announces lead, in mils, by estimating speed of target for particular shell and charge. Approximate leads are as follows:

0 to 5 mph (0.0 to 8.05 km/hr)	5 mils
6 to 10 mph (9.65 to 16.09 km/hr)	10 mils
11 to 15 mph (17.69 to 24.13 km/hr)	15 mils

e. Gives the fire commands as follows:

(1) TARGET (DESCRIPTION/LOCATION)

(2) SHELL (TYPE)

(3) CHARGE (TYPE)

(4) FUZE (TYPE)

(5) LEAD (LEFT OR RIGHT SO MUCH)

(6) RANGE (SO MUCH)

(7) FIRE AT WILL (unless otherwise notified)

f. Gives the following subsequent commands based on observed effect:

(1) CHANGE IN LEAD (RIGHT OR LEFT SO MUCH)

(2) CHANGE IN QUADRANT (ADD OR DROP)

WARNING

When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

DUTIES OF THE ASSISTANT GUNNER

NOTE

To be sure backlash is eliminated when laying for direction and elevation, last motion of all control and leveling knobs will be in a clockwise direction.

The assistant gunner lays the howitzer for elevation as follows:

a. Cross-levels M172 telescope and quadrant mount by centering bubble in cross level vial.

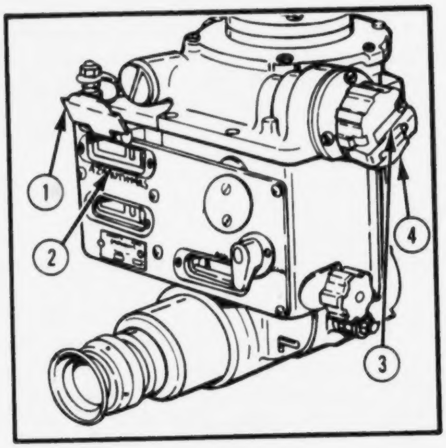
b. Using direct fire range plate, determines elevation based on announced range, charge, and projectile; and elevates or depresses cannon tube (p 2-2) to keep appropriate mil line of elbow telescope on center mass of target, then announces, SET.

c. Continues to announce, SET, as long as target is being tracked.

d. For subsequent rounds, changes the mil line based on commands from the chief of section.

LAYING FOR DIRECTION AND ELEVATION, AND LOADING AND FIRING THE HOWITZER DURING DIRECT FIRE MISSIONS—Continued

DUTIES OF THE GUNNER



NOTE

To be sure backlash is eliminated when laying for direction and elevation, last motion of all control and leveling knobs will be in a clockwise direction.

The gunner lays the howitzer for direction as follows:

a. Cross-levels M171 telescope and quadrant mount by centering bubble in cross level vial.

b. Opens azimuth counter door (1), sets azimuth counter (2) to 3200 by turning azimuth knob (3), and turns azimuth bar knob (4) to DIRECT.

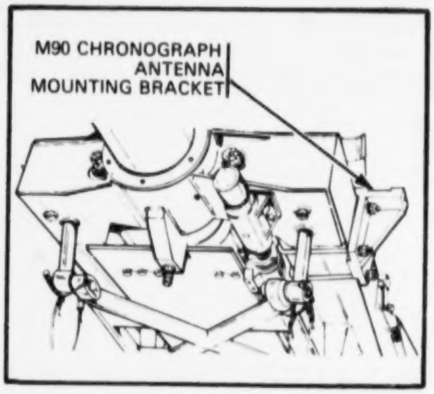
c. Tracks target (if moving) by traversing weapon. If a lead is announced by the chief of section, it can be applied with azimuth knob (3). With azimuth bar knob (4) on DIRECT, azimuth counter (2) will click every 5 mils. The lead can also be applied with reticle lead. The gunner should use appropriate mil line of reticle pattern to obtain desired lead.

d. When proper sight picture exists and cannoneer no. 1 announces, PRIMED, the assistant gunner announces, SET, continuously until the gunner commands, FIRE.

DUTIES OF REMAINDER OF SECTION

Performs duties as in indirect fire until END OF MISSION or CHECKFIRE is commanded by the chief of section.

OPERATING AUXILIARY EQUIPMENT

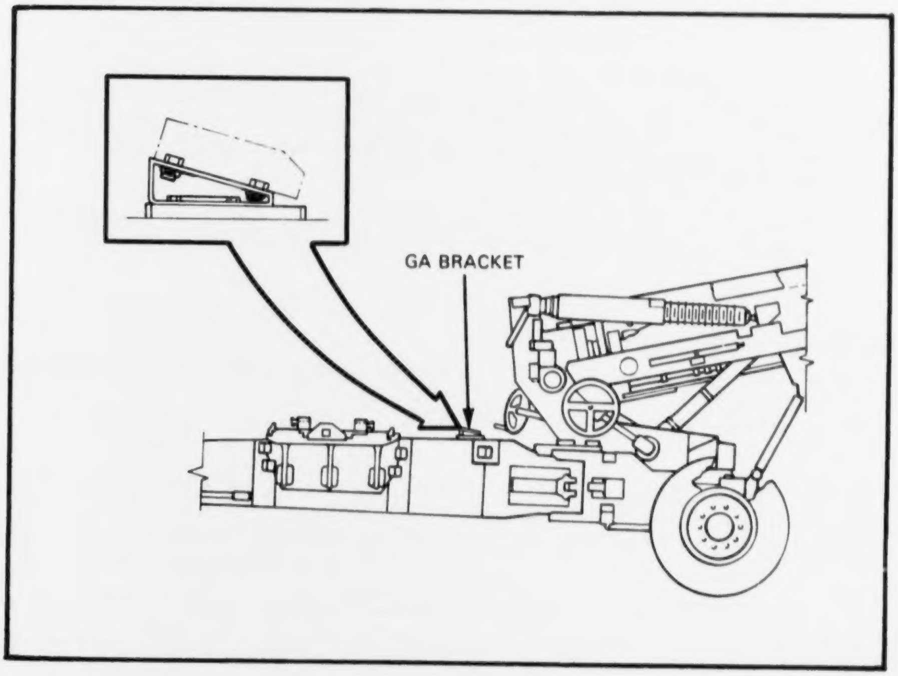


M90 CHRONOGRAPH

The M90 chronograph antenna mounting bracket mounted on the cradle assembly is for installation of the M90 chronograph antenna bracket assembly. Instructions for the operation of the M90 chronograph are in TM 9-1290-359-12&P.

BATTERY COMPUTER SYSTEM (BCS) GUN ASSEMBLY

Three gun assembly (GA) brackets are mounted on top of each trail, immediately forward of the spade stowage brackets. One GA bracket is on the right trail; two GA brackets are on the left trail. Instructions for operation of the BCS gun assembly are in TM 11-7440-283-12-1, TM 11-7440-283-12-2, and TM 11-5820-882-10.



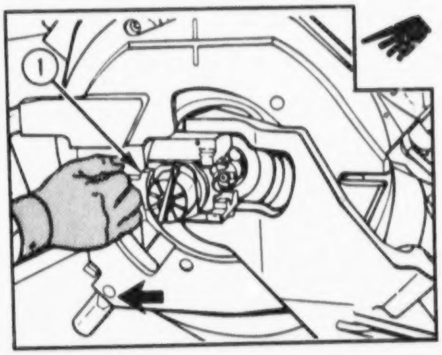
UNLOADING A STICKER ROUND

WARNING

Stickers may occur when firing charge 2. When stickers occur, the projectile lodges in tube and hot gasses under pressure are trapped in the chamber. Removal of the primer is dangerous as it will be shooting rearward when released. Do not stand behind the breech when removing the primer; the expelled primer may cause injury to personnel standing in its path or ricochet. Do not grasp the firing mechanism block assembly so that your hand is in the way of the expelling primer.

1 Standing to the left side of the breech, cannoneer no. 1 grasps the knob on the firing mechanism block assembly (1) and pulls outward until it is free to be opened. Keeping the knob out, cannoneer no. 1 then firmly slides the firing mechanism block assembly toward the open position until the primer pops and the gasses vent.

2 Fire at Charge 5 or higher with proper authority.



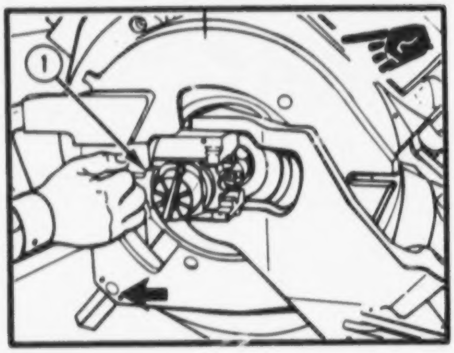
NOTE

No significant range loss is expected when firing sticker.

UNLOADING AN UNFIRED ROUND

WARNING
A complete round, once loaded, should be fired. However, if an unfired projectile must be removed, proceed as follows. For misfire/checkfire procedures, refer to page 4-39.

For extraction of M712 projectile (Copperhead), see page 4-57.



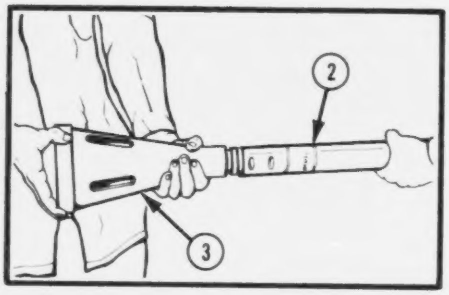
1 Cannoneer no. 1 slides firing mechanism block assembly (1) left to eject primer, and then slides firing mechanism block assembly right to firing position.

UNLOADING AN UNFIRED ROUND—Continued

2 The assistant gunner levels cannon tube.

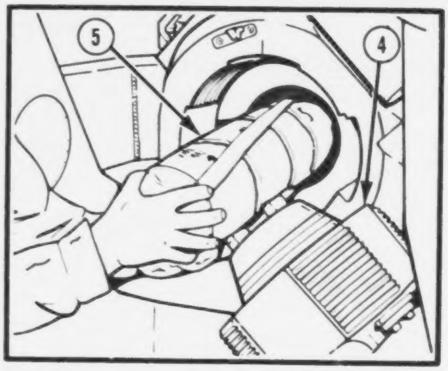
WARNING
Ensure that proper artillery rammer (8767210) is used.

3 The ammunition team chief assembles at least seven sections of rammer staff (2) to bell rammer (3).

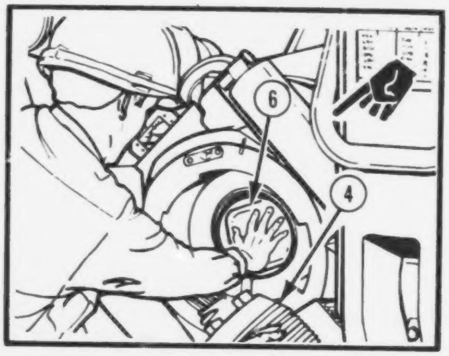


4 Cannoneer no. 1 opens breechblock assembly (4) (p 2-1).

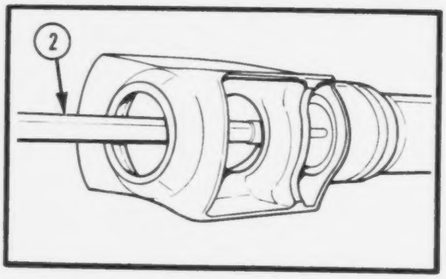
5 Cannoneer no. 1 removes propelling charge (5) and hands it to cannoneer no. 3.



6 Cannoneer no. 3 hands chamber swab (6) (item 8.0, app B), to cannoneer no. 1 who places it in powder chamber and closes breechblock assembly (4).



7 Cannoneers no. 4 and 5, and the ammunition team chief insert bell rammer end of rammer staff (2) into bore and push carefully until it encloses fuze and comes into contact with ogive of projectile.



UNLOADING AN UNFIRED ROUND—Continued

8 Cannoneers no. 4 and 5, and the ammunition team chief push or, if necessary, tap rammer staff (2) until projectile is dislodged from its seat.

9 Cannoneers no. 4 and 5, and the ammunition team chief push projectile from cannon tube into powder chamber.

10 Cannoneer no. 1 opens breechblock assembly and removes chamber swab. Cannoneers no. 2 and 3 position projectile loading tray on breech ring assembly to accept projectile. Cannoneers no. 4 and 5, and the ammunition team chief push projectile onto projectile loading tray.

11 Cannoneers no. 4 and 5, and the ammunition team chief remove rammer staff (2) from cannon tube.

12 Cannoneer no. 2 isolates removed round for inspection by local explosive ordnance disposal (EOD) personnel.

TRAVERSING BEYOND CARRIAGE TRAVERSE LIMITS AND OPERATING SPEED SHIFT ASSEMBLY

CAUTION

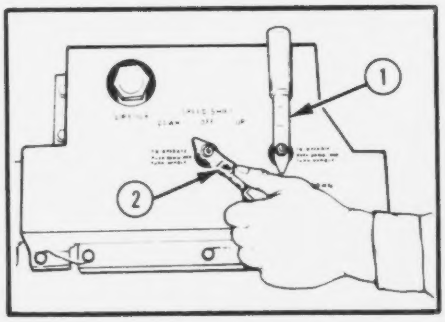
Do not use the firing baseplate and detent assembly as a speed shift assembly.

1 Upon receipt of the command DEFLECTION (SUCH-AND-SUCH), the gunner determines the deflection to be out of normal traverse limits. The gunner then announces SPEED SHIFT, MUZZLE RIGHT or MUZZLE LEFT as required.

WARNING

Before attempting to shift direction of howitzer by using speed shift assembly, be sure weapon is free of all ammunition and WHEELS lever (1) is in the OFF position.

2 Cannoneer no. 3 lifts up and moves SPEEDSHIFT lever (2) to the DOWN position.



NOTE

The 800-mil elevation provides the balance point for speed shifting howitzer. Higher elevations will produce a higher load at the ends of trails, while lower elevations will produce a negative (no load) condition.

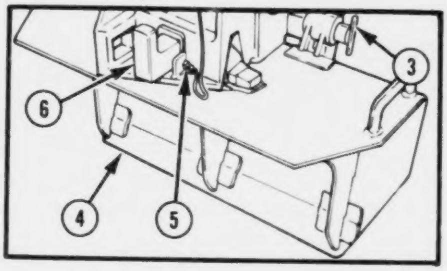
3 The assistant gunner elevates or depresses cannon tube (p 2-2) as required to position cannon tube at approximately 800-mil elevation.

TRAVERSING BEYOND CARRIAGE TRAVERSE LIMITS AND OPERATING SPEED SHIFT ASSEMBLY—Continued

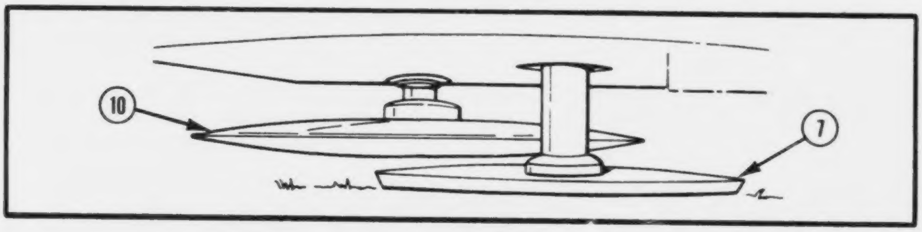
NOTE

Be sure that plunger weldment handles (3) on spades (4) are inserted into trails so that spades can hang loose and pivot.

4 If necessary, remove spade retaining pin (5) and spade key (6).



5 When speed shift assembly (7) is being lowered, cannoneers no. 1 and 5, and gunner should hold down left trail, and cannoneer no. 2, the ammunition team chief, and the assistant gunner should hold down right trail.



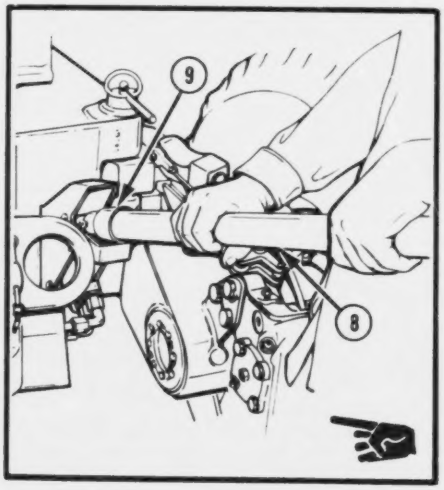
NOTE

When speed shifting the weapon on soft soil, such as mud or sand, place logs, ammunition packing material, or other similar supports under speed shift assembly (7) for stabilization.

6 Cannoneers no. 3 and 4 insert pump handles (8) into hydraulic adapters (9) and pump up and down to lower speed shift assembly (7) until clearance is obtained beneath firing baseplate (10).

CAUTION

Never fire howitzer while speed shift assembly is supporting weapon.



TRAVERSING BEYOND CARRIAGE TRAVERSE LIMITS AND OPERATING SPEED SHIFT ASSEMBLY—Continued

7 When gunner or chief of section commands, TRAILS UP, cannoneers no. 1, 3, 5, and the driver lift left trail and cannoneers no. 3 and 4, the ammunition team chief, and the assistant gunner lift right trail and move trails in direction indicated by the gunner. When pantel vertical hairline is alined or close to azimuth marker, the gunner commands, TRAILS DOWN.

8 Cannoneer no. 6 and the ammunition team chief pivot spades (4) to firing position and reinstall spade key (6) and spade retaining pin (5) if removed.

WARNING
Keep feet from under firing baseplate.

9 Cannoneer no. 3 lifts up SPEEDSHIFT lever and moves it to the UP position to allow howitzer to lower to the ground.

10 Cannoneers no. 3 and 4 pump up and down on pump handles (8) to raise speed shift assembly (7). Cannoneer no. 3 lifts up SPEEDSHIFT lever and moves it to the OFF position.

11 All emplace weapon.

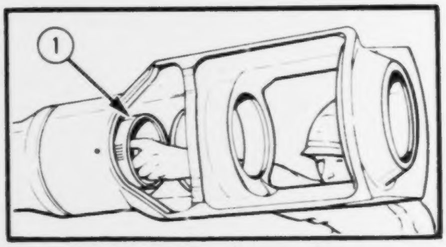
* PREPARATION OF HOWITZER FOR TOWING

0.1 Check tires for damage and correct inflation pressure.

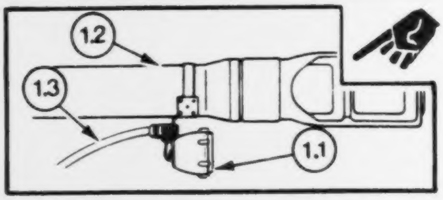
CAUTION
Towing restrictions are limited to: 15 mph maximum over cross-country roads, 30 mph maximum over secondary roads, and 45 mph maximum over improved roads.

1 The chief of section ensures there is no ammunition in cannon tube.

2 After depressing cannon tube within reach, cannoneer no. 4 installs muzzle plug (1) and cover if available.



2.1 Cannoneer no. 3 installs vehicular taillight (1.1) on cannon tube (1.2) and connects cable assembly (1.3).



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*Procedures for march order have been standardized under the Department of the Army Standardization Program.

PREPARATION OF HOWITZER FOR TOWING—Continued

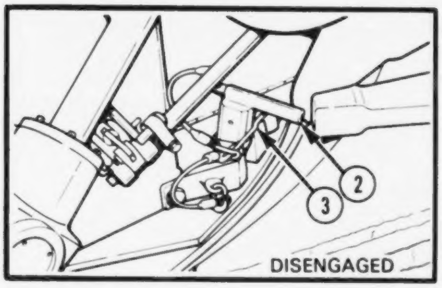
CAUTION

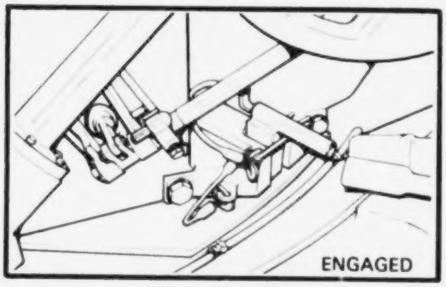
Do not traverse the top carriage unless the wheels are locked in the up (firing) position or down (towed) position.

3 The gunner and assistant gunner position the cannon tube in center of traverse and set cannon tube at 250 mils (p 2-2).

CAUTION

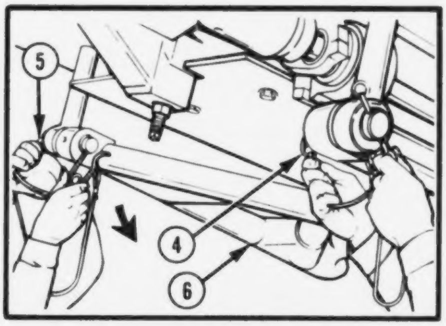
Do not move howitzer in travel lock position if top carriage locking pin is missing or disengaged.





4 The gunner engages top carriage locking pin (2) by removing retaining pin (3) and pushing down on top carriage locking pin. The gunner then inserts retaining pin to secure top carriage locking pin.

5 Cannoneers no. 3 and 4 remove retaining pins (4) and travel lock pins (5) and lower travel lock assembly (6).

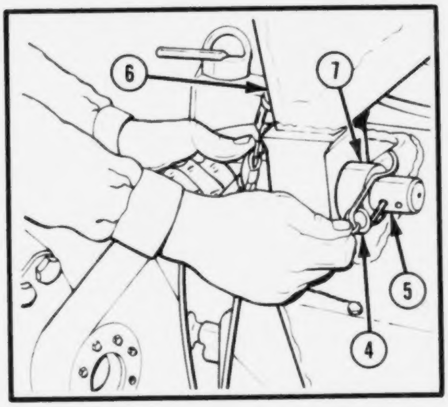


PREPARATION OF HOWITZER FOR TOWING—Continued

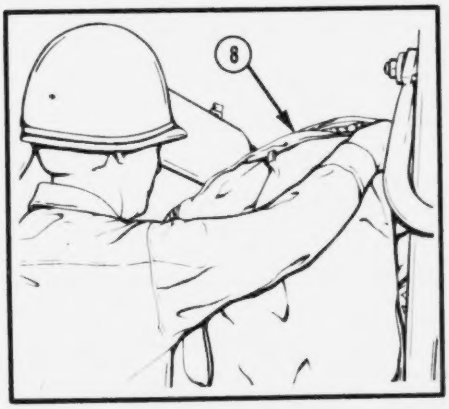
CAUTION

Both travel lock pins (5) must be installed in travel lock assembly (6) before moving howitzer.

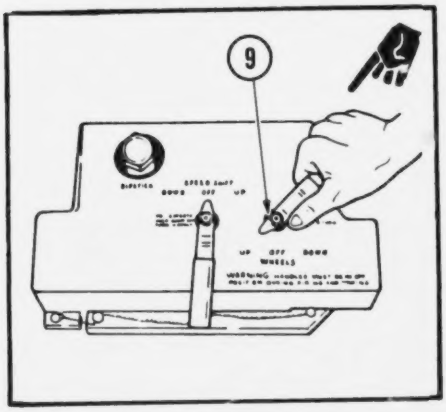
6 The gunner elevates or depresses cannon tube (p 2-2) until travel lock assembly (6) is alined in brackets (7). Cannoneers no. 3 and 4 then insert travel lock pins (5) and retaining pins (4).



7 Cannoneer no. 1 installs breech cover (8).



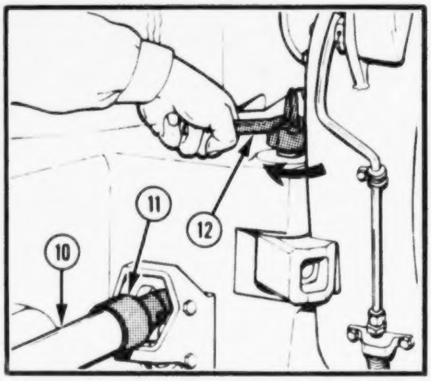
8 Cannoneer no. 3 pushes down and turns WHEELS lever (9) to the UP position.



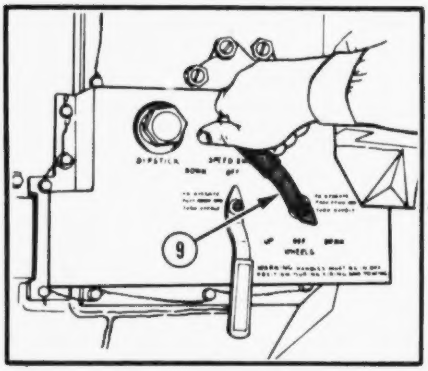
PREPARATION OF HOWITZER FOR TOWING—Continued

9 Cannoneers no. 3 and 4 place pump handles (10) in hydraulic adapters (11) and pump until pressure is off of wheel lock handles (12).

10 Cannoneers no. 3 and 4 then turn wheel lock handles (12) in (toward center of howitzer).

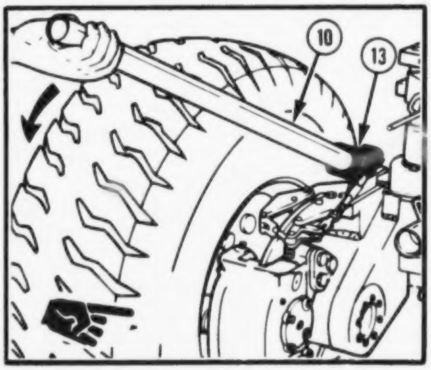


11 Cannoneer no. 3 pushes down and turns WHEELS lever (9) to the DOWN position.



WARNING
Handbrakes are to remain locked if the howitzer is on any degree of an incline and are not to be released until the lunette is on the prime mover pintle. Release of handbrakes while howitzer is on incline may allow the howitzer to roll causing injury to personnel.

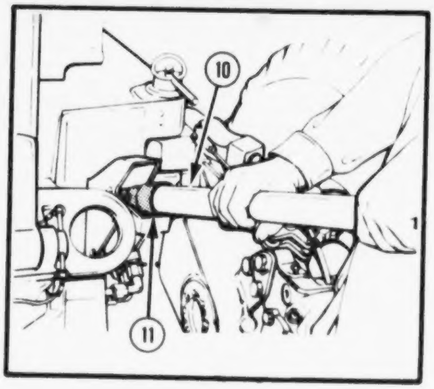
12 Cannoneers no. 3 and 4 release handbrakes by inserting pump handles (10) in handbrake sockets (13) and pulling downward.



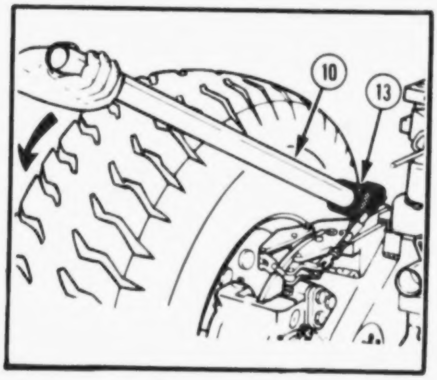
PREPARATION OF HOWITZER FOR TOWING—Continued

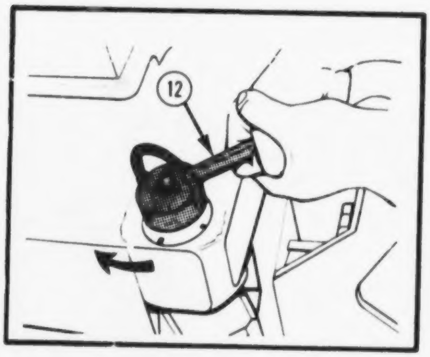
WARNING
Keep feet from under firing baseplate.

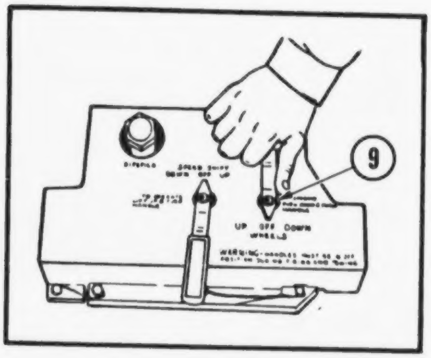
13 Cannoneers no. 3 and 4 insert pump handles (10) in hydraulic adapters (11) and pump up and down until carriage is up.



13.1 If handbrakes were released in step 12, cannoneers no. 3 and 4 reset handbrakes by inserting pump handles (10) in handbrake sockets (13) and raising up to the locked position.







14 Cannoneers no. 3 and 4 turn wheel lock handles (12) (toward wheels).

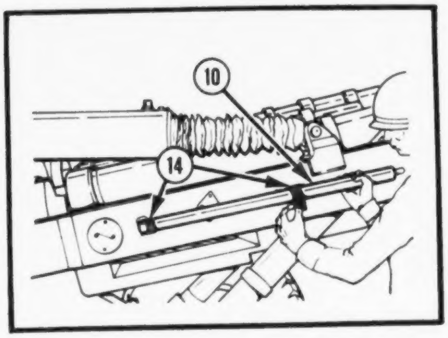
15 Cannoneer no. 3 pushes down and turns WHEELS lever (9) to the OFF position.

PREPARATION OF HOWITZER FOR TOWING—Continued

NOTE

Move WHEELS lever back and forth on either side of the OFF mark to relieve pressure on the hydraulic system.

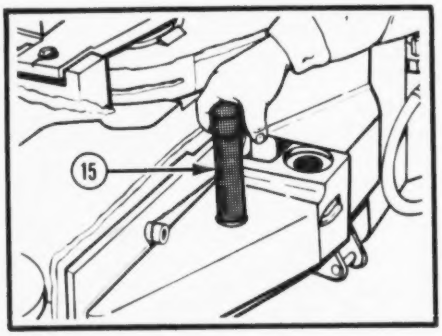
16 Cannoneers no. 3 and 4 replace pump handles (10) in their holders (14).



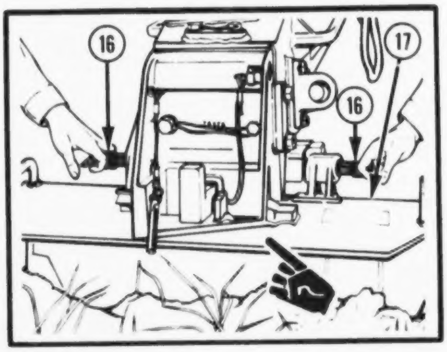
NOTE

Drive out locking plugs (15) with a sledge hammer.

17 The gunner and assistant gunner move left and right locking plugs (15) from the firing position (front) to the stowed position (rear).



18 Cannoneer no. 2 and the assistant gunner pull out plunger weldment handles (16) on right spade (17). Cannoneers no. 1 and 3 pull out plunger weldment handles on left spade.

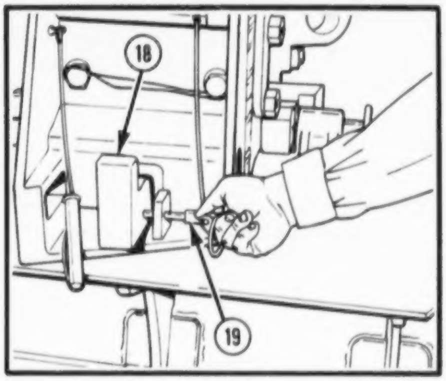


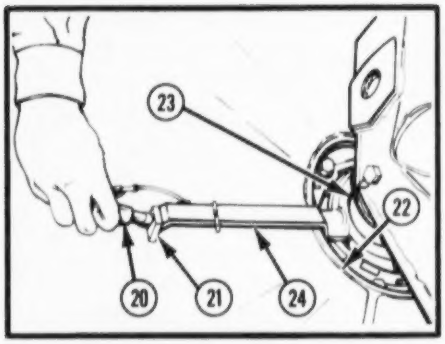
PREPARATION OF HOWITZER FOR TOWING—Continued

NOTE

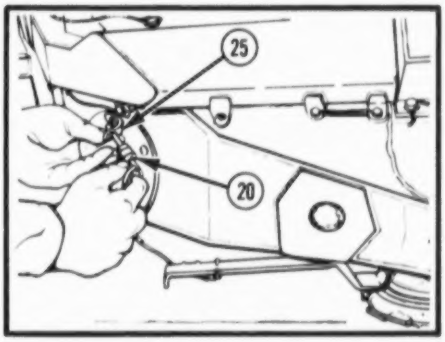
It may be necessary to use weapons handling bar or sledge hammer to loosen spade keys (18).

19 Cannoneer no. 5 removes left and right spade retaining pins (19) and spade keys (18). Stow retaining pins and spade keys.





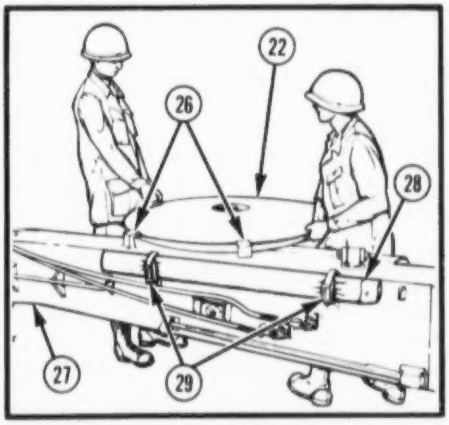
20 Cannoneer no. 4 removes quick release pin (20) from locking bracket (21) and unlocks firing baseplate (22) from ball (23), using lock-release lever (24). Cannoneer no. 3 supports firing baseplate.



21 Cannoneer no. 4 places quick release pin (20) in stowage bracket (25).

22 Cannoneers no. 3 and 4 place firing baseplate (22) in stowage brackets (26) on right trail (27).

23 After putting aiming posts in aiming post cover (28), the ammunition team chief places cover and aiming posts in stowage brackets (29) on right trail (27).

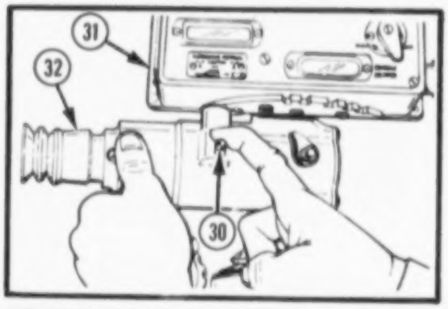


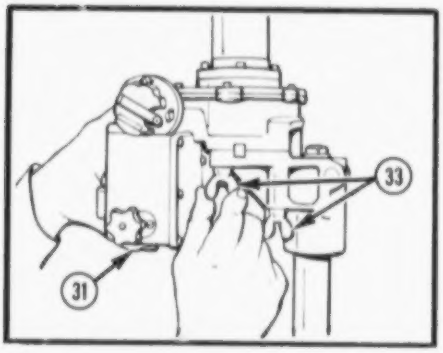
PREPARATION OF HOWITZER FOR TOWING—Continued

WARNING

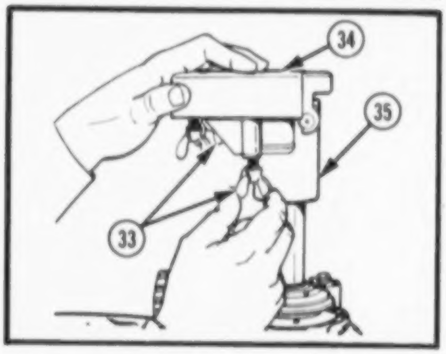
When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

24 The gunner releases locking pin (30) on pantel (31) and moves elbow with eyepiece (32) to the stowed position.



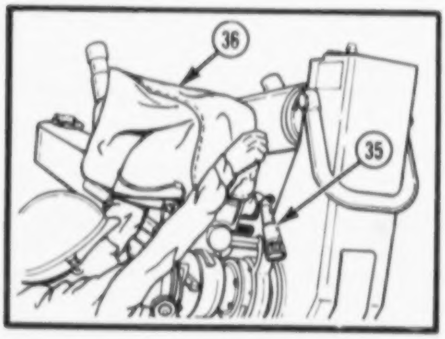


25 The gunner loosens four wing nuts (33), removes pantel (31), and places it in fire control equipment carrying case.



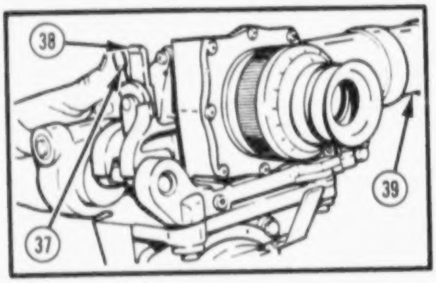
26 The gunner places protective cover (34) on M171 telescope and quadrant mount (35) and tightens two wing nuts (33). He then rotates the protective covers on the cross level vial, pitch level vial, and elevation level vial to the closed position.

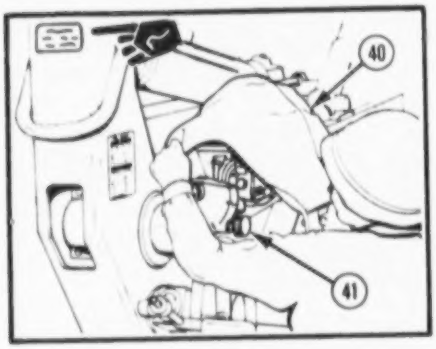
27 The gunner places telescope and mount cover (36) over M171 telescope and quadrant mount (35). He then secures the cover with the drawstring provided.

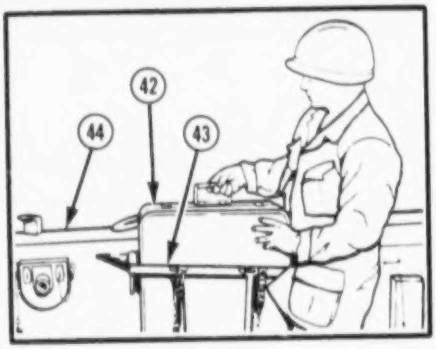


PREPARATION OF HOWITZER FOR TOWING—Continued

28 The assistant gunner rotates lock-release lever (37) counterclockwise and pulls locking latch (38) down, removes elbow telescope (39), replaces the protective cover assembly, and places it in fire control equipment carrying case.





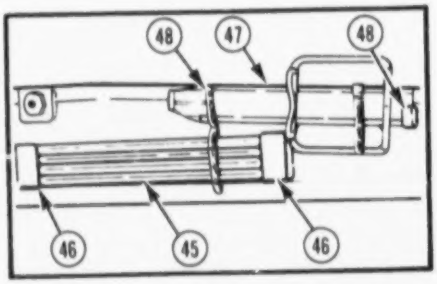


29 The assistant gunner rotates the protective covers on the elevation level vial and cross level vial to the closed position. The assistant gunner places telescope and mount cover (40) on M172 telescope and quadrant mount (41) and secures it with drawstrings provided.

30 The gunner ensures that all fire control equipment is properly placed within the carrying case and that the case is securely latched. The gunner places fire control equipment carrying case (42) in its stowage rack (43) on the left trail (44). He then secures the case to the trail with two web straps provided.

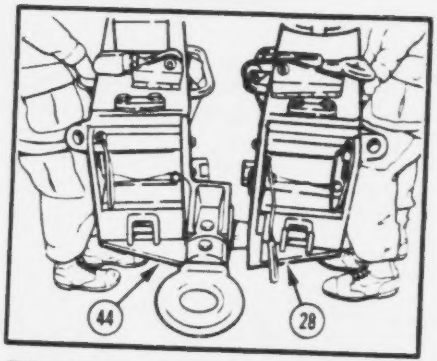
31 Cannoneer no. 2 disassembles rammer staff, places staff sections (45) in stowage brackets (46) on both trails and places bell rammer in its stowage bracket on right trail, if used.

32 Cannoneer no. 3 places loading tray (47) in its stowage brackets (48).

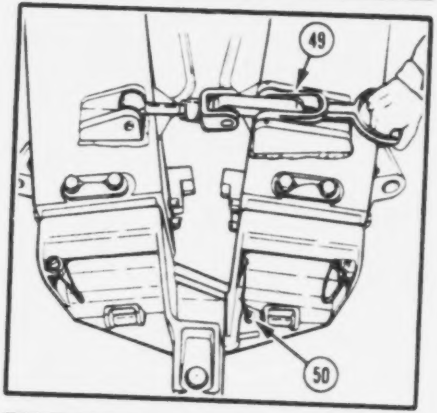


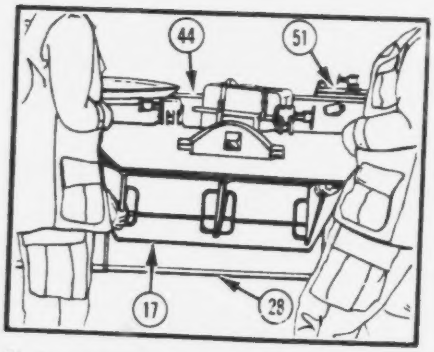
PREPARATION OF HOWITZER FOR TOWING—Continued

33 When the chief of section commands, LIFT, the gunner and cannoneers no. 1, 3, and 5 lift left trail (44), the assistant gunner, cannoneers 2 and 4, and the ammunition team chief lift right trail (28), and all personnel close trails.

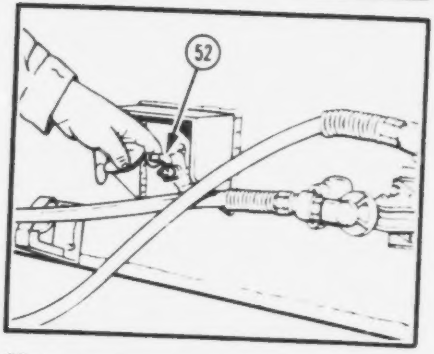


34 The chief of section fastens trail lock (49) and places trail retaining pin (50) in position.





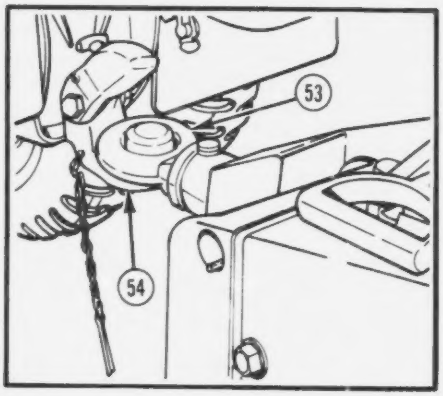
35 Cannoneers no. 3 and 5 return left spade (51) to the stowed position on left trail (44). Cannoneers no. 2 and 4 return right spade (17) to right trail (28).



36 The assistant gunner closes air drain cock (52) on emergency reserve air tank.

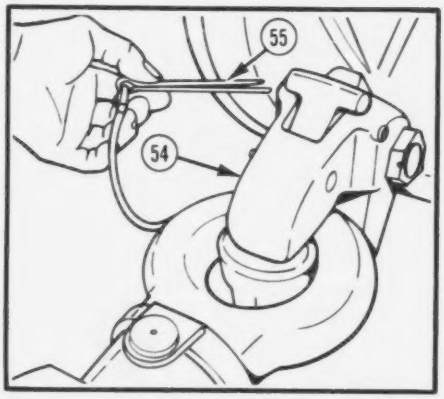
PREPARATION OF HOWITZER FOR TOWING—Continued

WARNING
Personnel should stay clear of area between prime mover and howitzer.

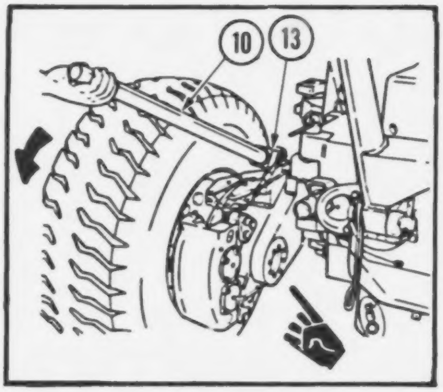


37 The chief of section directs the driver to back prime mover close to howitzer.

38 When the chief of section commands, LIFT, the assistant gunner, cannoneers no. 2 and 4, and the ammunition team chief lift right trail, and the gunner and cannoneers no. 1, 3, and 5 lift left trail to raise lunette (53). The chief of section directs the driver to back pintle (54) under lunette, and all personnel lower lunette on pintle.



39 The ammunition team chief latches pintle (54) and secures it with cotter pin (55).

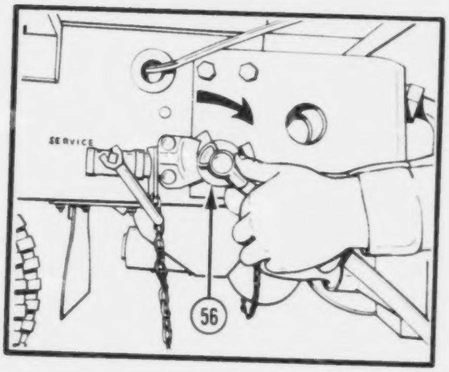


39.1 Cannoneers no. 3 & 4 release handbrakes by inserting pump handles (10) in handbrake sockets (13) and pulling downward.

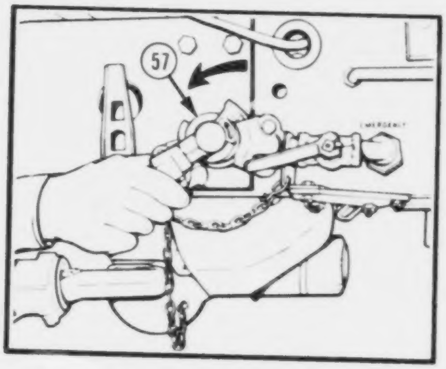
PREPARATION OF HOWITZER FOR TOWING—Continued

CAUTION

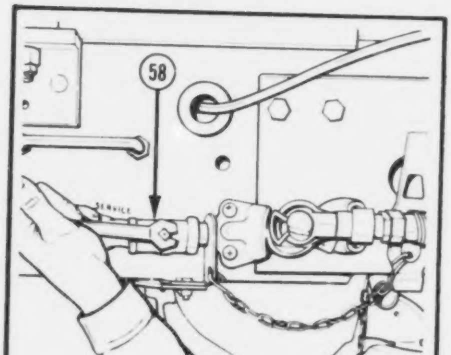
Make sure service hose assembly is connected to service coupling (left side) of prime mover and emergency hose assembly is connected to emergency coupling (right side) of prime mover. Hose assemblies are identified by a metal band. When hose assemblies are properly attached, they will cross each other.



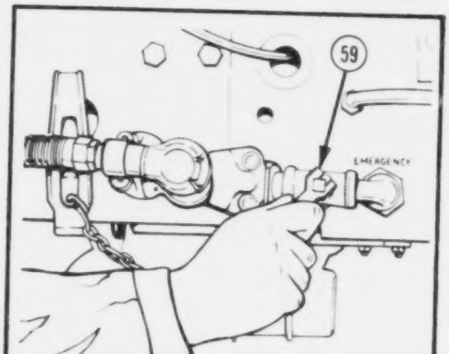
40 Cannoneer no. 4 disconnects service hose assembly (56) from dummy coupling and passes it to the ammunition team chief who connects it to prime mover.



41 Cannoneer no. 4 disconnects emergency hose assembly (57) from dummy coupling and passes it to cannoneer no. 5 who connects it to prime mover.



42 The ammunition team chief opens service air line cutout cock (58).

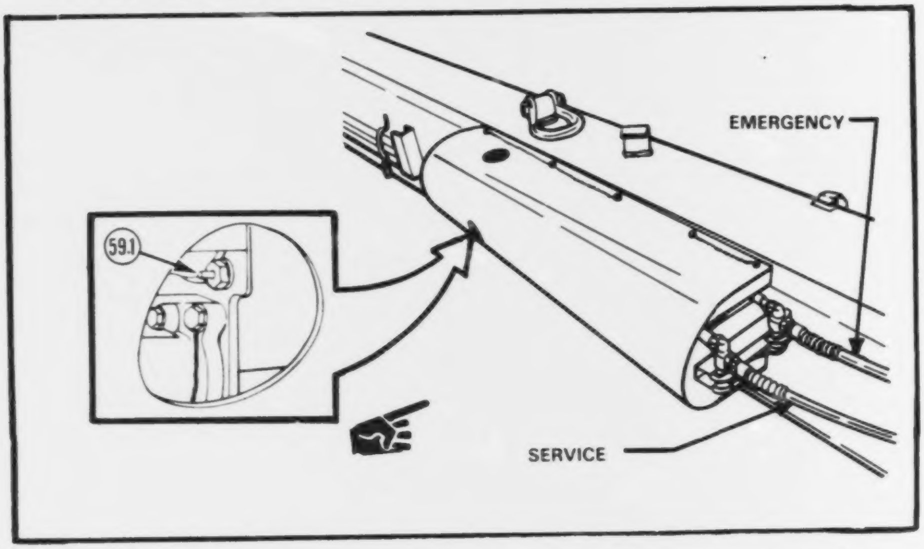


43 Cannoneer no. 5 opens emergency air line cutout cock (59).

PREPARATION OF HOWITZER FOR TOWING—Continued

CAUTION

Failure to check power booster indicator rod could result in damage to the disk brake carrier and lining assembly.

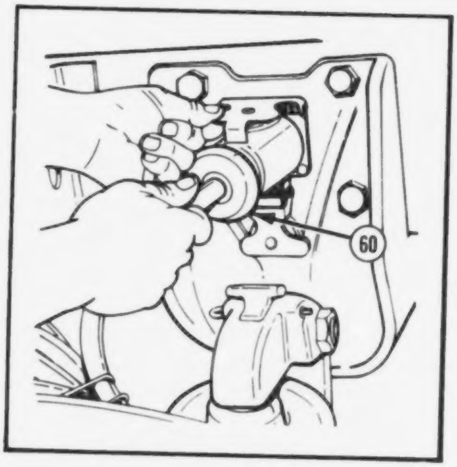


43.1 The driver applies brakes on prime mover, and cannoneer no. 5 checks power booster indicator rod (59.1) to ensure it does not protrude more than 1-3/4 in. (4.45 cm).

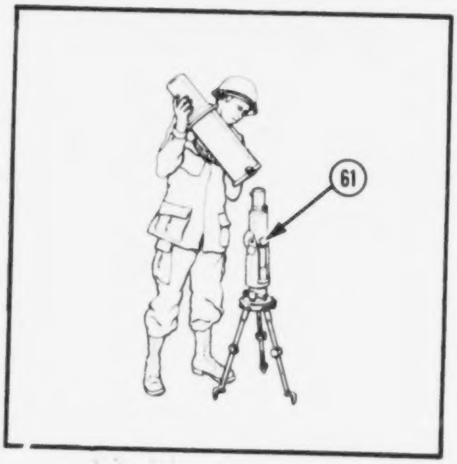
43.2 The driver releases brakes on prime mover, and cannoneer no. 5 checks power booster indicator rod (59.1) to ensure it does not protrude more than 1/2 in. (1.27 cm).

PREPARATION OF HOWITZER FOR TOWING—Continued

43.3 Deleted.



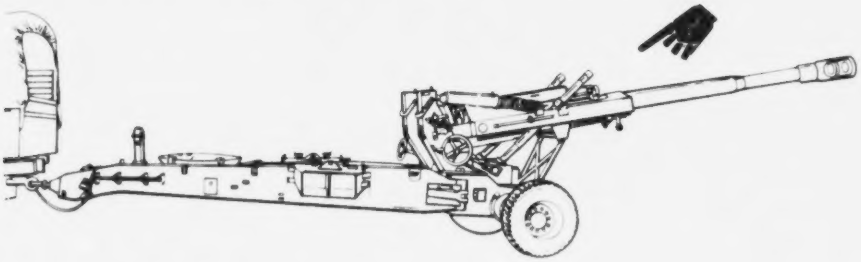
44 If required, cannoneer no. 5 connects cable assembly (60) to prime mover.



WARNING
When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

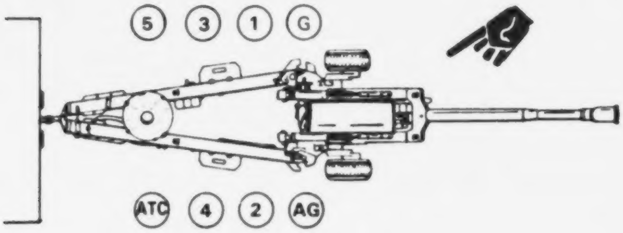
45 Cannoneer no. 2 recovers collimator (61) and sandbags.

PLACING M198 HOWITZER IN STOWED POSITION



NOTE

Ensure howitzer is on level ground and elevated to approximate travel lock position when traversing gun into stowed position.

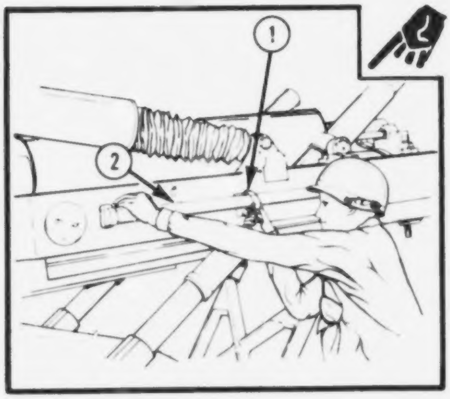


1 After prime mover comes to a complete stop, the chief of section commands, DISMOUNT. Upon hearing the command, the section exits through rear of prime mover.

2 All section members take position as illustrated.

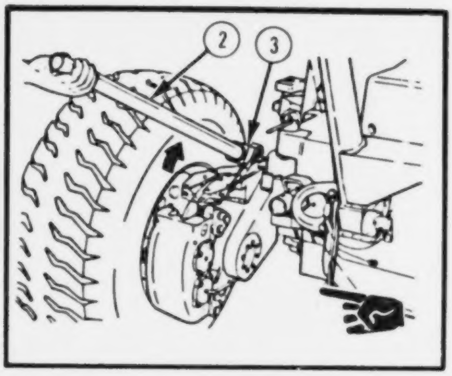
3 The chief of section commands, PREPARE FOR ACTION.

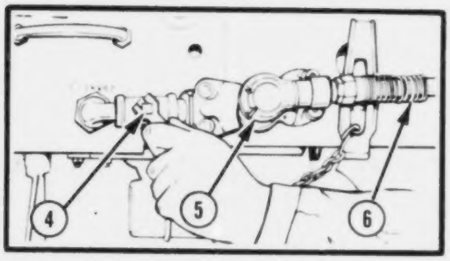
4 Assistant gunner unlatches holder (1) on right side and removes pump handle (2). Gunner unlatches holder on left side.



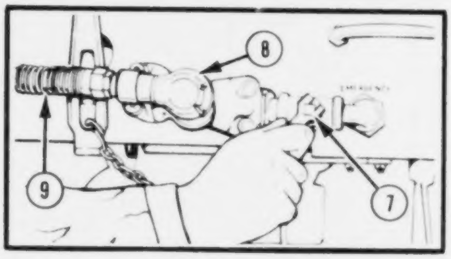
PLACING M198 HOWITZER IN STOWED POSITION—Continued

5 The gunner and assistant gunner set left and right handbrakes by inserting pump handles (2) into handbrake sockets (3) and raising up to locked position.

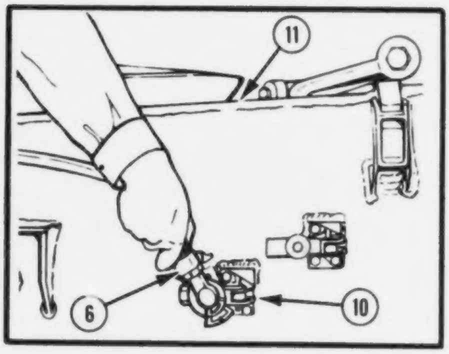




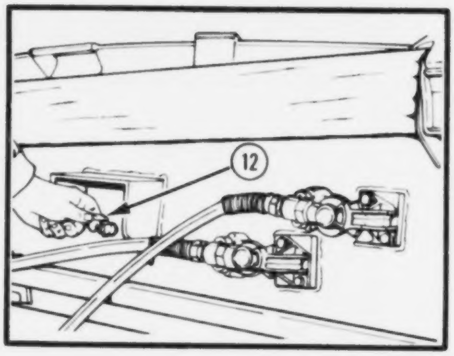
6 The ammunition team chief closes service air line cutout cock (4) at prime mover, uncouples service air line coupling (5), and passes service hose assembly (6) to cannoneer no. 4.



7 Cannoneer no. 5 closes emergency air line cutout cock (7) at prime mover, disconnects emergency air line coupling (8), and passes emergency hose assembly (9) to cannoneer no. 4.

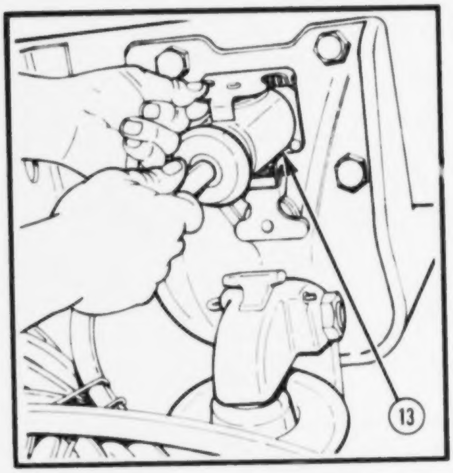


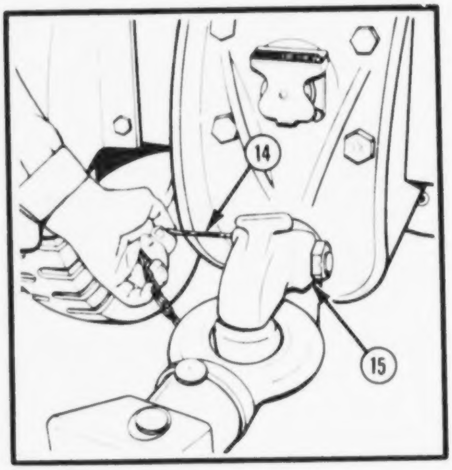
8 Cannoneer no. 4 connects service hose assembly (6) to dummy coupling (10) on right trail (11). The emergency hose assembly is connected to other dummy coupling.



9 Cannoneer no. 4 opens drain cock (12) on emergency reserve air tank.

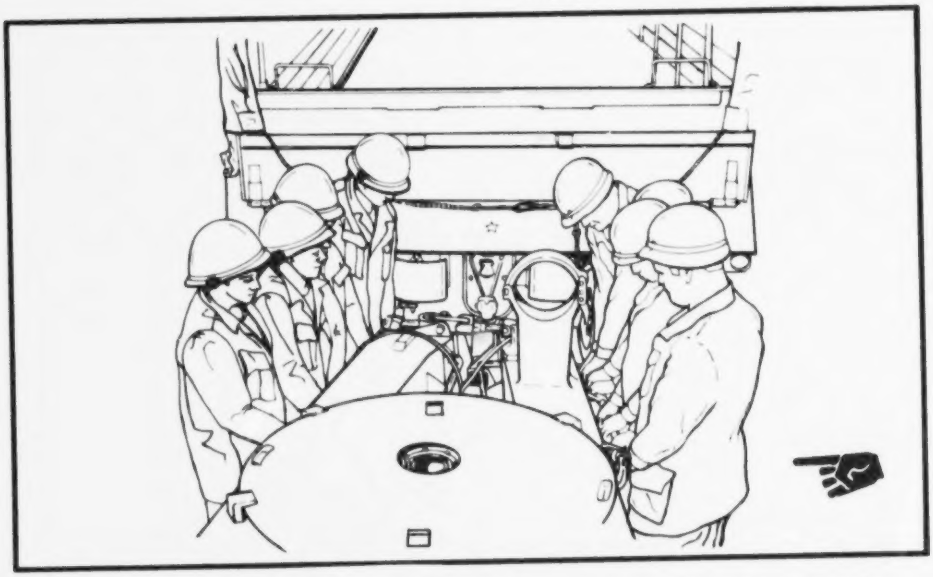
PLACING M198 HOWITZER IN STOWED POSITION—Continued





10 Cannoneer no. 5 disconnects blackout light cable assembly (13) from prime mover, if connected.

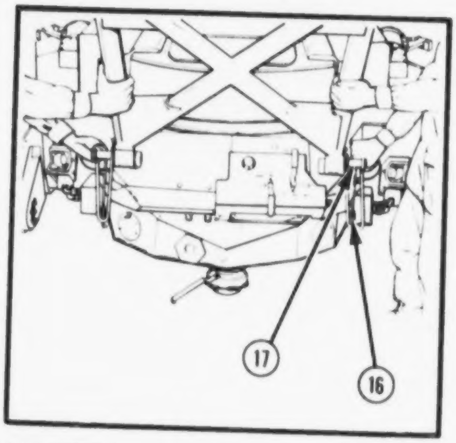
11 The ammunition team chief removes cotter pin (14) and unlatches pintle (15) on prime mover.



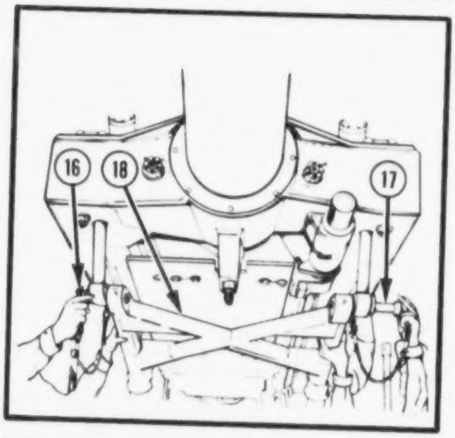
12 With cannoneers no. 1, 3, and 5, and the gunner at left trail lifting handle and the assistant gunner, the ammunition team chief and cannoneers no. 2 and 4 at the right trail, raise lunette from pintle when chief of section commands LIFT. The chief of section then commands the driver to move prime mover forward. Trails are then lowered to the ground.

PLACING M198 HOWITZER IN STOWED POSITION—Continued

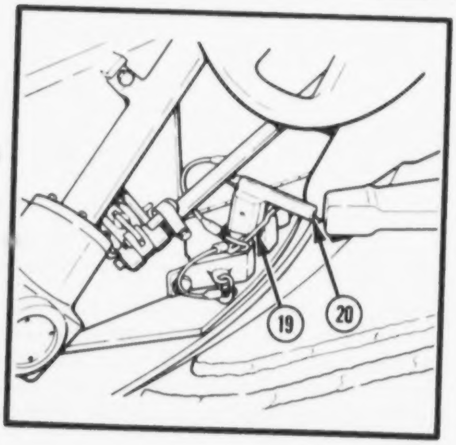
13 Cannoneer no. 3 removes left retaining pin (16) and travel lock pin (17). Cannoneer no. 4 removes right retaining pin and travel lock pin.



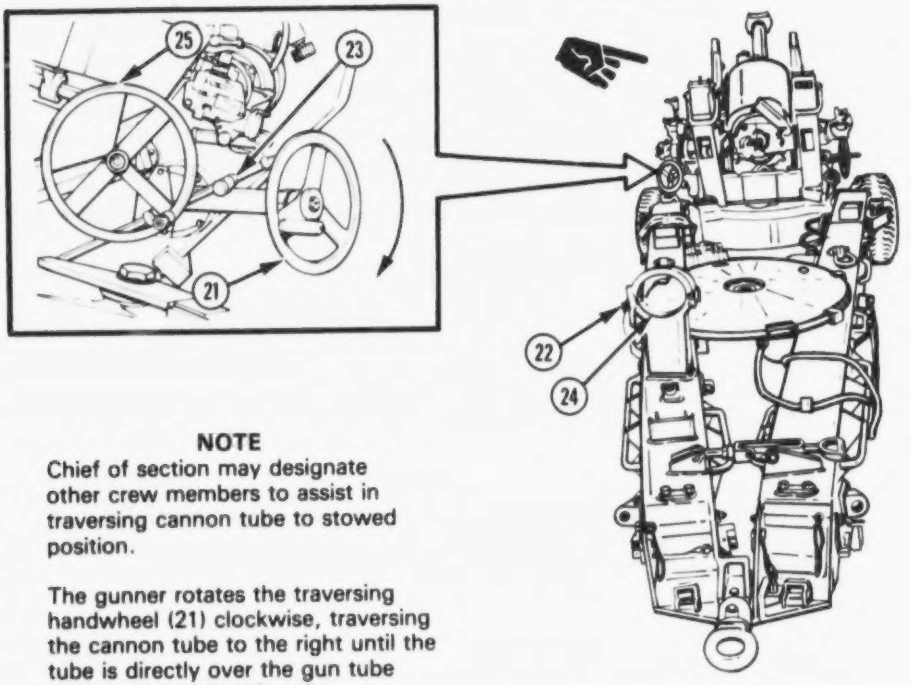
14 Cannoneers no. 3 and 4 swing travel lock assembly (18) up and insert travel lock pins (17) and retaining pins (16).



15 The gunner removes retaining pin (19) from top carriage locking pin (20), pulls up on top carriage locking pin to the disengaged (up) position and secures top carriage locking pin with retaining pin.



PLACING M198 HOWITZER IN STOWED POSITION—Continued



NOTE

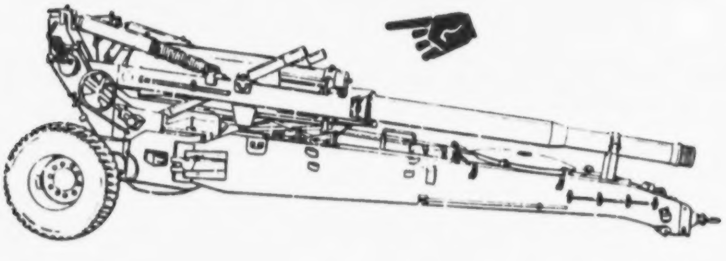
Chief of section may designate other crew members to assist in traversing cannon tube to stowed position.

The gunner rotates the traversing handwheel (21) clockwise, traversing the cannon tube to the right until the tube is directly over the gun tube travel lock on the left trail.

Cannoneer no. 5 opens the lock release lever (22). The gunner depresses the manual control lever (23) and lowers the cannon tube onto the travel lock cradle (24) by rotating the elevating handwheel (25) counterclockwise, then secures the lock release lever completing the stow.

NOTE

The muzzle brake must be removed to tow weapon in the stowed position.



Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-5. GENERAL

This section contains special instructions for operating and servicing the weapon under unusual conditions. Special care must be taken in cleaning and lubrication when extremes in temperature, humidity, and terrain conditions are present or anticipated, in addition to performing all normal preventive maintenance services. Proper cleaning, lubrication, and storage and handling of oil and lubricants not only ensure proper operation and functioning but also guard against excessive wear of the working parts and deterioration of the materiel.

2-6. EXTREME COLD WEATHER CONDITIONS

a. General Problems.

(1) Extensive preparation of materiel scheduled for operation in extreme cold weather is necessary. Generally, extreme cold will cause lubricants to thicken or congeal.

CAUTION

It is important that the approved practices and precautions be followed. FM 9-207 contains general cold weather information applicable to the M198 howitzer. It must be considered an essential part of this technical manual.

(2) For description of operation in extreme cold, refer to FM 31-70, FM 31-71, and FM 9-207.

b. Equilibrators. Extreme cold temperatures will cause a corresponding decrease of nitrogen pressure in the equilibrators, making it difficult to elevate the cannon tube. The equilibrators should be manually adjusted (p 3-55) to develop equal handwheel loads while elevating and depressing. If equilibrators cannot be manually adjusted properly, notify organizational maintenance.

b.1 Tires. Tires should be inflated to their respective pressures (p 1-13) at ambient temperature.

c. Fire Control Equipment.

(1) When not in use, fire control equipment should be kept covered in the proper carrying cases or properly stowed.

(2) Do not let snow or ice accumulate on equipment. Moving parts must be kept free of moisture.

(3) Use only dry rags (item 13, app D) and dry lens paper (item 12, app D) for cleaning.

(4) Do not grasp metal parts, such as knobs, levers, covers, etc, with bare hands.

(5) Working parts may operate or function sluggishly. The operator should be able to differentiate between sluggishness and lack of movement because of built-in stops. Do not force movements beyond their stops.

(6) Do not expose M137 panoramic telescope, M138 elbow telescope or M139 alinement device to sudden changes in temperature by moving them from very cold to warm or warm to very cold areas. Fracturing of lenses, windows, or prisms may occur.

2-7. EXTREME HOT WEATHER CONDITIONS

a. General Problems.

(1) In hot climates, the film of oil necessary for operation and preservation will quickly disappear. Inspect the cannon and carriage daily, paying particular attention to hidden surfaces, such as bore and chamber, springs, spring seats, firing pin, and other likely places where corrosion might occur and not be quickly noticed.

(2) Perspiration from the hands can help cause rusting. After handling, clean, wipe dry, and lubricate (LO 9-1025-211-13).

b. Ammunition Problems.

(1) Since explosives are adversely affected by high temperatures, ammunition must be protected from sources of high temperatures, including the direct rays of the sun. Elements in primers and fuzes are particularly sensitive to high temperatures.

WARNING

Do not fire WP projectiles which are known to have been stored in other than a base down position. Firing of such projectiles could contribute to inbore or close-in premature malfunctions.

(2) Whenever practicable, white phosphorous-loaded smoke projectiles should be stored at temperatures below the melting point (+111.4°F (+44.11°C)) of the white phosphorous filler. If not practicable, white phosphorous projectiles should be stored on their bases so that if the white phosphorus filler melts, it will resolidify with void spaces in the normal position (in the nose of the projectile) when the temperature falls below its melting point. Prematures have been caused by voids in the base end of the white phosphorous projectile, and erratic performance may result from voids in its side. Refer to page 4-45 for precautions in handling ammunition in high temperatures.

c. **Tires.** Keep tires covered with available materials to protect them from direct rays of the sun, to prevent excessive air pressure, and to prevent deterioration of rubber. Tires should be inflated to their respective pressures (p 1-13) at ambient temperature.

d. **Equilibrators.** Extreme hot temperatures will cause a corresponding increase of nitrogen pressure in the equilibrators, making it difficult to depress the cannon tube. The equilibrators should be manually adjusted (p 3- 55) to develop equal handwheel loads while elevating and depressing. If equilibrators cannot be manually adjusted properly, notify organizational maintenance.

2-8. OPERATION IN HOT, DAMP, AND SALTY ATMOSPHERE

a. Materiel should be inspected daily when being operated in hot, moist, and salty areas.

b. When the material is active, clean and lubricate the bore and exposed metal surfaces daily (LO 9-1025-211-13).

c. Moist and salty atmospheres can destroy the rust-preventive qualities of oils and greases. Inspect parts daily for corrosion. Keep covers in place as much of the time as firing conditions permit.

d. When the materiel is inactive, the unpainted parts should be covered with a film of PL-S (item 11, app D). All covers should be in place.

e. Do not break moisture-resistant seals of ammunition containers until the ammunition is to be used.

f. Keep ammunition dry and free from mud, corrosion, or foreign matter. Provide proper drainage around the area to keep it as dry as possible.

g. Proximity (VT) fuzes must be protected against dampness. Although the fuzes are nearly waterproof, any exposure to dampness may increase the number of duds. Rain or immersion in water will speed up deterioration. Especially in tropical climates, the storage time of unpacked fuzes should be kept to a minimum. Fuzes must be stored in their original sealed containers as long as it is practical.

h. Optical instruments are protected against moisture by pressurized nitrogen. If moisture is present, notify organizational maintenance.

i. Salt deposits are especially harmful to optical surfaces. Deposits should be loosened by sponging with a clean wiping rag (item 13, app D). Deposits should not be rubbed.

2-9. UNUSUAL TERRAIN CONDITIONS

a. **Soft or Rough Terrain.** When traveling on soft or rough terrain, such as mud, sand, or snow, use care when backing weapon attached to prime mover.

b. **Sand, Dust, and Dirt.** Inspect and lubricate the materiel (LO 9-1025-211-13), except exposed lubricated parts, frequently when operating in sandy or unusually dusty areas. Be careful to keep sand and dust out of mechanisms and oil receptacles when carrying out inspection and lubrication operations and when making adjustments and repairs. Keep all covers in place as much of the time as firing conditions permit. Shield parts from flying sand and dust with tarpaulins or with the telescope and mount covers during disassembly and assembly operations. When beginning an action in sandy or dusty areas, remove lubricants from recoil rails and any other exposed lubricated parts, situation permitting. Lubricants will pick-up sand and dirt, forming an abrasive which will cause rapid wear. With surfaces dry, there is less wear than when they are coated with lubricant contaminated with sand or dirt. Clean and lubricate all exposed parts (LO 9-1025-211-13) after the action is over.

2-10. FORDING OPERATIONS

a. **Deep-Water Fording.** Refer to TM 9-238 for general information, description, and methods of using deep-water fording kits.

b. **After-Fording Operations.** Immediately after weapon is towed from the water, if tactical situation permits, perform the following services:

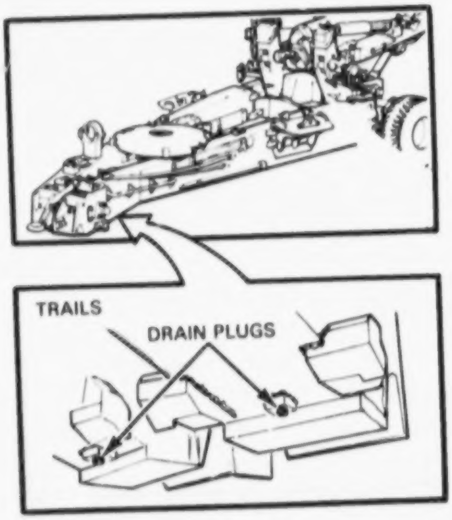
(1) Notify organizational maintenance to remove the wheels with hubs and thoroughly clean with cleaning compound (item 2, app D) and dry all working parts of the handbrakes and wheel bearings. Lubricate the handbrakes (LO 9-1025-211-13).

(2) Empty any water from the materiel and clean, dry, and apply the proper lubricant (LO 9-1025-211-13) to all exposed unpainted surfaces, paying special attention to the bore and chamber, the recoil rails, and the equilibrator rod. Notify organizational maintenance for necessary disassembly, cleaning, and lubrication.

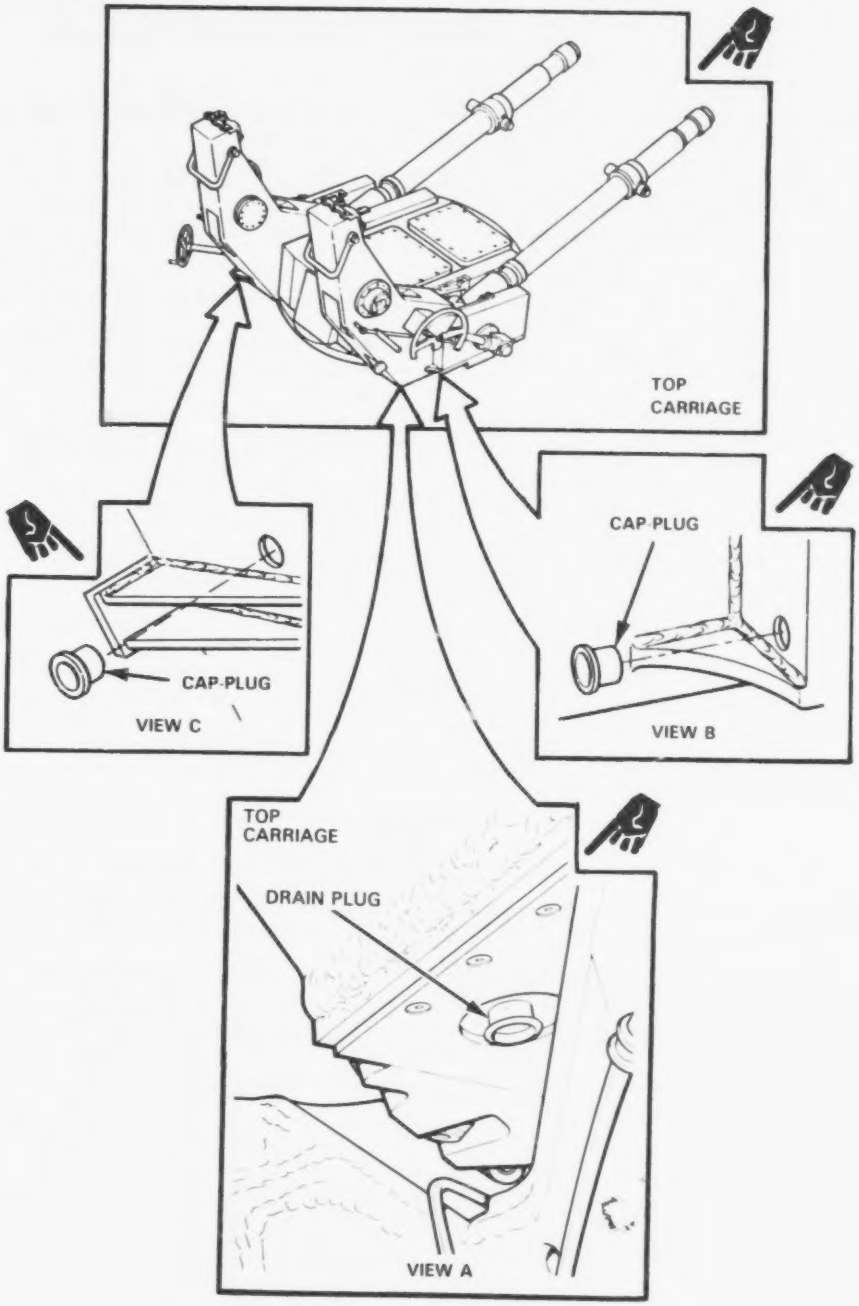
(3) Saltwater immersion greatly increases rusting and corrosion, especially on unpainted surfaces. It is most important to remove all traces of saltwater and salt deposits from every part of the cannon and carriage. Apply PL-S (item 11, app D) and notify organizational maintenance so that necessary complete disassembly, cleaning, and lubrication may be performed as soon as possible.

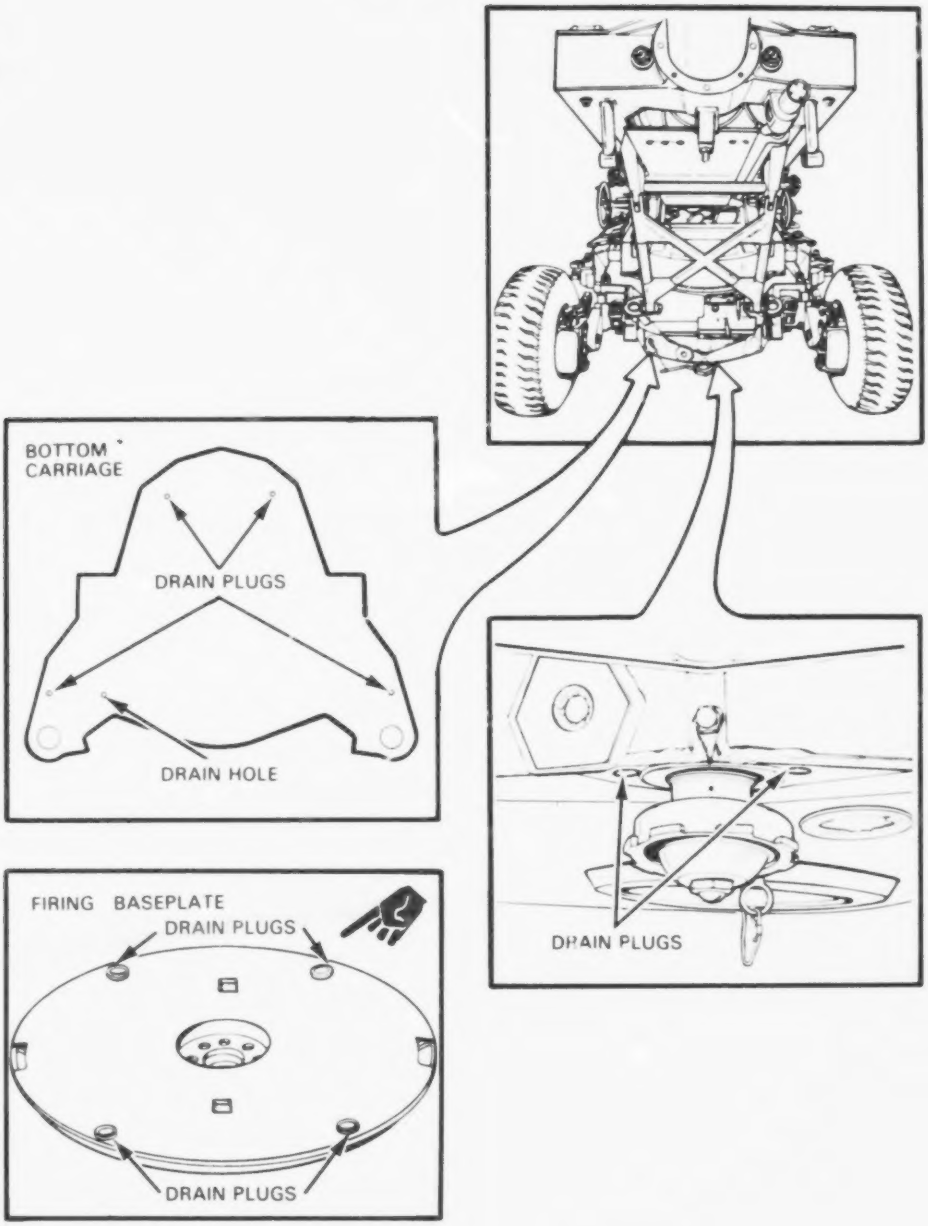
(4) Two drain plugs, one on each trail, are located toward the end on bottom side of trail. For removal of these plugs, notify organizational maintenance.

(5) Four drain plugs are located on the bottom of the bottom carriage, one plug each by the trail hinge points and one on each side by the ball where the firing baseplate attaches. Six drain plugs are located on the top carriage: two on the underside (view A), one each on the left and right side (view B), and one on the rear left and right trunnion posts (view C). (See page 2-119 for additional drain plug location.) For removal of drain plugs on trails, notify organizational maintenance. Make sure all drain plugs are reinstalled after all moisture is removed.



2-10. FORDING OPERATIONS—Continued


TOP
CARRIAGE
CAP-PLUG
VIEW C
CAP-PLUG
VIEW B
TOP
CARRIAGE
DRAIN PLUG
VIEW A


BOTTOM CARRIAGE
DRAIN PLUGS
DRAIN HOLE
DRAIN PLUGS
FIRING BASEPLATE
DRAIN PLUGS
DRAIN PLUGS

2-11. EMERGENCY PROCEDURES

Refer to FM 3-87, FM 21-40, and FM 3-5 for nuclear, biological, and chemical (NBC) decontamination procedures.

CHAPTER 3
MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1. GENERAL

For lubrication instructions, refer to LO 9-1025-211-13.

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Section II. TROUBLESHOOTING

3-2. INTRODUCTORY INFORMATION

a. The symptom index (p 3-15) can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order with a page number reference to the troubleshooting table where a test or inspection and corrective action are provided.

b. The troubleshooting table (p 3-16) lists the common malfunctions which you may find during operation or maintenance of the M198 howitzer or its components. You should perform the tests/inspections and corrective actions in the order listed.

c. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective action, notify your supervisor.

SYMPTOM INDEX

	Troubleshooting Procedure Page
CANNON	
Ambient temperature shown by thermal warning device indicator is incorrect	3-16
Blowback occurs around breechblock assembly	3-20
Breech mechanism assembly does not operate freely	3-21
Primer fails to extract and eject	3-19
Primer fails to fire	3-17
Primer fires, but weapon fails to fire	3-19
Thermal warning device has moisture on inside of window	3-16
Thermal warning device housing and band clamps are loose on cannon tube	3-16
Thermal warning device indicator will not return to ambient temperature	3-16
Thermal warning device window is not clear	3-16
CARRIAGE	
Brakes are locked	3-27
Brakes are weak	3-28
Length of recoil is incorrect	3-23
Play in traversing handwheel exceeds 1/12 turn (3-1/8 in. (7.94 cm))	3-23
Speed shift assembly cannot be extended or retracted	3-26
Top carriage is difficult to traverse	3-23
Traversing mechanism will not hold top carriage in cant position	3-23
Weapon is difficult to elevate and depress	3-22
Wheels will not lock in up/down position	3-25
Wheels will not move up or down	3-24
Wheels wobble or are out of line	3-25
FIRE CONTROL EQUIPMENT	
Collimator reticle image is not sharp	3-30
Counter dials, reticles, or level vials are broken	3-29
Counters, level vials, or reticles are not illuminated	3-29
Fire control knobs do not turn freely	3-29
Fitted parts of fire control equipment are loose	3-29
Moisture is in fire control equipment	3-29

SYMPTOM INDEX—Continued

RECOIL MECHANISM

Oil leaks from front yoke assembly	3-21
Oil leaks from recuperator cylinder assembly	3-22
Oil leaks from replenisher cylinder assembly	3-22
Oil reserve indicator shows oil reserve higher than 10 reserves or less than two reserves	3-22
Weapon does not return to battery or slams into battery	3-22

Troubleshooting Table

MALFUNCTION
  TEST OR INSPECTION
    CORRECTIVE ACTION

CANNON

1 **THERMAL WARNING DEVICE WINDOW IS NOT CLEAR.**

No further inspection is required.

Notify organizational maintenance.

2 **AMBIENT TEMPERATURE SHOWN BY THERMAL WARNING DEVICE INDICATOR IS INCORRECT.**

No further inspection is required.

Notify organizational maintenance.

3 **THERMAL WARNING DEVICE HOUSING AND BAND CLAMPS ARE LOOSE ON CANNON TUBE.**

No further inspection is required.

Notify organizational maintenance.

4 **THERMAL WARNING DEVICE HAS MOISTURE ON INSIDE OF WINDOW.**

No further inspection is required.

Notify organizational maintenance.

5 **THERMAL WARNING DEVICE INDICATOR WILL NOT RETURN TO AMBIENT TEMPERATURE.**

No further inspection is required.

Notify organizational maintenance.

Troubleshooting Table—Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

PRIMER FAILS TO FIRE.

6 Step 1. Make sure firing mechanism block assembly is completely closed (to the extreme right).

Move firing mechanism block assembly to the extreme right.

Step 1.1. Check for defective primer.

a. Use a different primer.

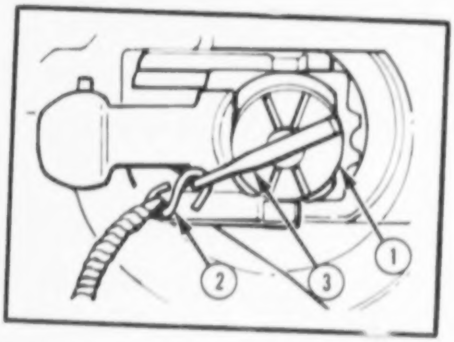
b. If weapon still fails to fire, follow misfire procedures (p 4-39).

Step 1.2. Deleted.

Troubleshooting Table – Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

6 PRIMER FAILS TO FIRE. – Continued



Step 2. With firing mechanism in firing position, attach a lanyard to the firing mechanism (1) by inserting S-hook (2) through hole in lanyard lever (3) and pull. A loud snap should be heard.

a. If a loud snap is heard, go to step 3.

b. If a loud snap is not heard, do the following:

(1) Remove, disassemble (p 3-34), clean with CLP (item 1.1, app D), and inspect firing mechanism.

(2) Reassemble and reinstall firing mechanism (p 3-37) and try to fire weapon.

(3) If weapon still fails to fire, replace firing mechanism (p 3-34).

Step 3. Remove firing mechanism and firing mechanism block assembly test firing pin by pushing on rear of firing pin. Firing pin should press in and return with spring action.

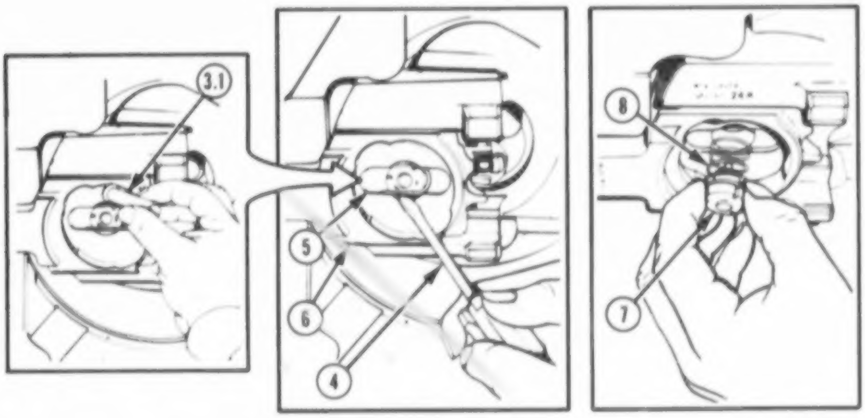
a. Depress firing pin, inspect pin protrusion from firing mechanism block assembly. Ensure firing pin is not broken or mushroomed over. Inspect firing pin guide hole in firing mechanism block assembly for excessive wear. (The guide hole should be slightly larger than the firing pin.) Replace firing mechanism block assembly (p 3-40) if hole appears too large.

Troubleshooting Table – Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

6 PRIMER FAILS TO FIRE. – Continued

b. If firing pin is broken, mushroomed, or if it does not return with spring action, do the following:



(1) Remove firing pin by using an expended primer case (3.1) or a flat-tip screwdriver (4) to remove the firing pin retainer (5) from the firing mechanism block assembly (6). Then remove the firing pin (7) and firing pin spring (8).

(2) Replace broken or mushroomed firing pin or broken firing pin spring.

(3) Clean firing mechanism block assembly with CLP (item 1.1, app D) and lube with CLP (item 1.1, app D).

(4) Reassemble firing mechanism block assembly (p 3-42).

Troubleshooting Table—Continued

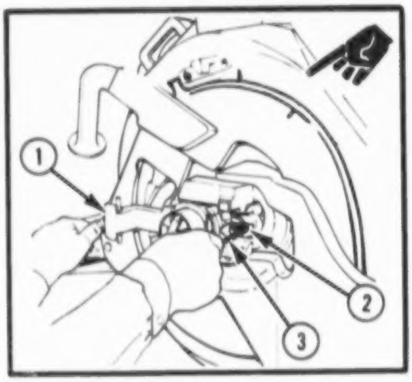
MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

7 PRIMER FIRES, BUT WEAPON FAILS TO FIRE.

Check for foreign matter in vent hole.

Slide firing mechanism block assembly (1) to the left and clean vent hole (2) by inserting vent cleaning tool (3) in vent hole and rotating clockwise completely through the vent.

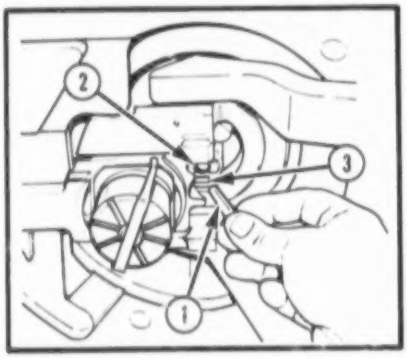


8 PRIMER FAILS TO EXTRACT AND EJECT.

Step 1. Check for stuck primer.

Open breechblock assembly, slide vent cleaning tool through vent hole, and tap out primer.

Step 2. Check the primer casing (1) for deformity, and check the primer cavity (2) in the breechblock assembly for dirt or fouling.



Clean the primer cavity with vent cleaning tool.

Step 3. Check for worn or damaged cartridge extractor (3).

If damaged, notify organizational maintenance.

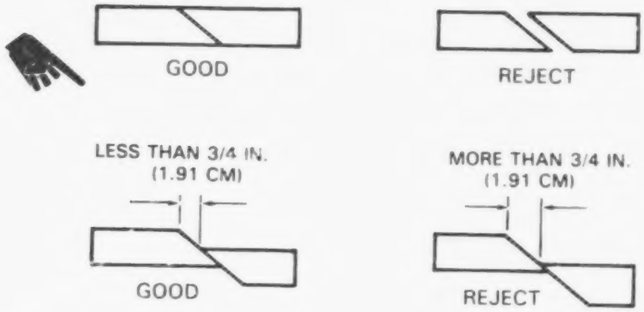
MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

9 BLOWBACK OCCURS AROUND BREECHBLOCK ASSEMBLY.

Step 0.1. Check to see if split rings are properly installed.

Step 1. Check the front split ring (1) to be sure it is not cracked, bulged, broken, that there is contact at the split, and the spread on the split is no greater than 3/4 in. (1.91 cm).

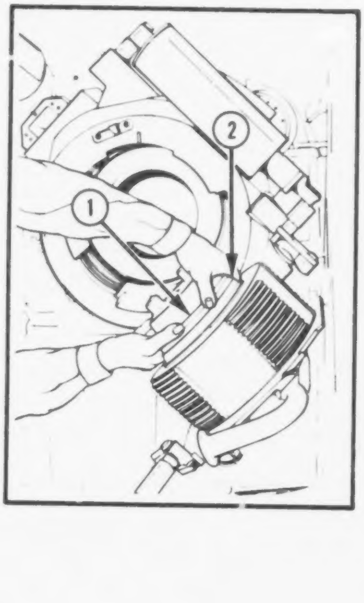
Replace front split ring (1).



Step 2. Check that the front split ring (1) is free to turn. Grasp front split ring and try to turn it in either direction.

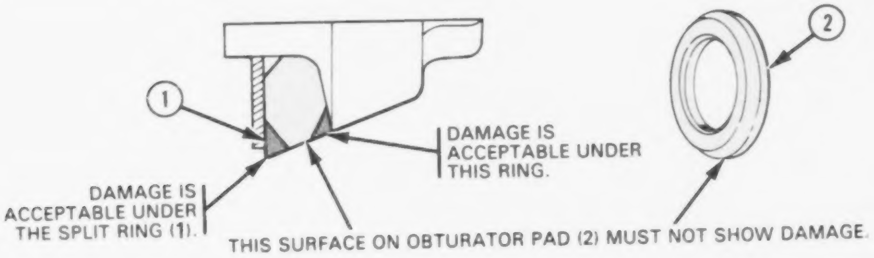
a. If front split ring does not turn, examine the split to ensure no foreign matter is present. Remove foreign matter from split if necessary.

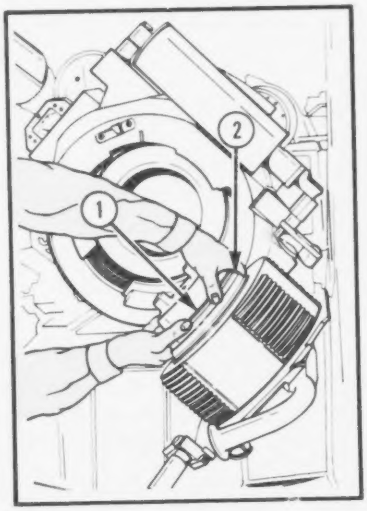
b. Turn front split ring so that the splits in front and rear split rings are 180 degrees apart. Make sure the split is not alined with a crack, gouge, or worn spot on the obturator pad (2).



MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

9 BLOWBACK OCCURS AROUND BREECHBLOCK ASSEMBLY.—Continued


①
②
DAMAGE IS ACCEPTABLE UNDER THIS RING.
DAMAGE IS ACCEPTABLE UNDER THE SPLIT RING (1).
THIS SURFACE ON OBTURATOR PAD (2) MUST NOT SHOW DAMAGE.



Step 3. Inspect obturator pad (2). The area where split ring (1) rests and outside diameter of obturator pad must be smooth.

Replace obturator pad (p 3-43) if these areas are not smooth. The obturator pad is serviceable if there is a smooth portion of the obturator pad against which the front split ring can rest and the outside diameter surface is smooth.

Step 4. At next firing, check for blowback.

If blowback continues, notify organizational maintenance.

Troubleshooting Table—Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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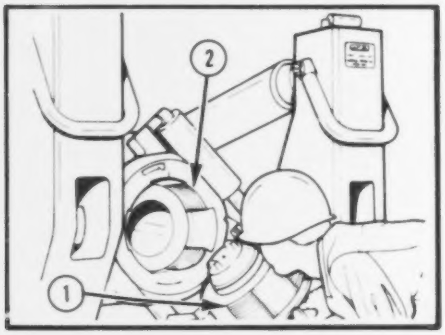
10 BREECH MECHANISM ASSEMBLY DOES NOT OPERATE FREELY.



Step 1. Check for dirty threads on breechblock assembly (1) or breech ring assembly (2).

Clean threads with CLP (item 1.1, app D).

Step 2. Check for proper lubrication.

Follow lube instructions in LO 9-1025-211-13.

Step 3. Check for damaged, dirty, or worn breech mechanism assembly components.

Disassemble breech mechanism assembly (p 3-33). Clean all parts, except obturator pad, with CLP (item 1.1, app D) as necessary. Clean obturator pad with soap (item 14, app D) and water. Replace authorized parts as necessary. For replacement of other parts, notify organizational maintenance.

RECOIL MECHANISM

11 OIL LEAKS FROM FRONT YOKE ASSEMBLY.

No further inspection is required.

Notify organizational maintenance.

Troubleshooting Table—Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

12 **OIL RESERVE INDICATOR SHOWS OIL RESERVE HIGHER THAN 10 RESERVES OR LESS THAN TWO RESERVES.**

No further inspection is required.

Notify organizational maintenance.

13 **OIL LEAKS FROM REPLENISHER CYLINDER ASSEMBLY.**

No further inspection is required.

Notify organizational maintenance.

14 **OIL LEAKS FROM RECUPERATOR CYLINDER ASSEMBLY.**

No further inspection is required.

Notify organizational maintenance.

15 **WEAPON DOES NOT RETURN TO BATTERY OR SLAMS INTO BATTERY.**

No further inspection is required.

Notify organizational maintenance.

CARRIAGE

16 **WEAPON IS DIFFICULT TO ELEVATE AND DEPRESS.**

Check to see if there is equal effort between elevating and depressing the weapon.

a. If there is not an equal effort between elevating and depressing the weapon, adjust the equilibrator (p 3-55).

b. If problem continues, notify organizational maintenance.

Troubleshooting Table—Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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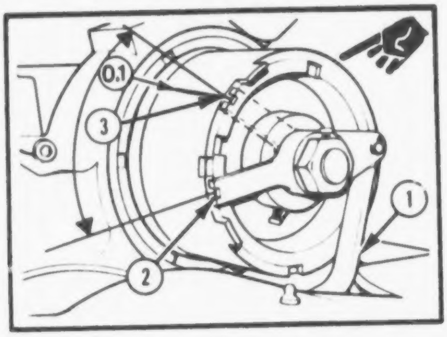
17 **LENGTH OF RECOIL IS INCORRECT.**



NOTE

To observe the 55-degree mark from the ground, right side of weapon, apply a chalk mark (0.1) on the outside diameter of the recuperator cylinder.

Elevate weapon to approximately 1025 mils and check for movement of the variable recoil rigid connecting link (1). The 55-degree (from vertical) scribe line (3) on end of recuperator cylinder should be within the notch on end of lever (2).

If the movement does not correspond to above description, notify organizational maintenance.

18 **PLAY IN TRAVERSING HANDWHEEL EXCEEDS 1/12 TURN (3-1/8 IN. (7.94 CM)).**

No further inspection is required.

Notify organizational maintenance.

19 **TOP CARRIAGE IS DIFFICULT TO TRAVERSE.**

Check for obstructions.

Notify organizational maintenance.

20 **TRAVERSING MECHANISM WILL NOT HOLD TOP CARRIAGE IN CANT POSITION.**

No further inspection is required.

Notify organizational maintenance.

Troubleshooting Table—Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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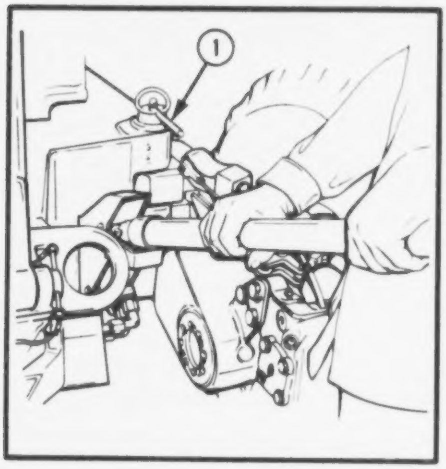
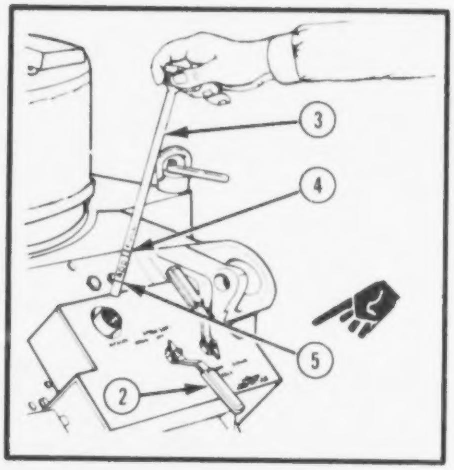
21 WHEELS WILL NOT MOVE UP OR DOWN.





Step 1. Check for engaged wheel lock handles (1).

Disengage wheel lock handle by pulling upward on wheel lock handle and turning inward.

Step 2. Check to see if SPEEDSHIFT lever (2) is in UP or DOWN position.

Lift up SPEEDSHIFT lever and move to OFF position.

Step 3. Check hydraulic fluid level in manifold assembly by unscrewing and removing dipstick (3). Hydraulic fluid must be present between full mark (4) and add mark (5).

a. If hydraulic fluid is not between the full and add marks, fill as required (p 3-66).

b. If hydraulic fluid is at proper level and problem persists, notify organizational maintenance.

Step 4. Check to ensure that drain cock on emergency reserve air tank is open (p 2-56).

Troubleshooting Table—Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

22 WHEELS WILL NOT LOCK IN UP/DOWN POSITION.

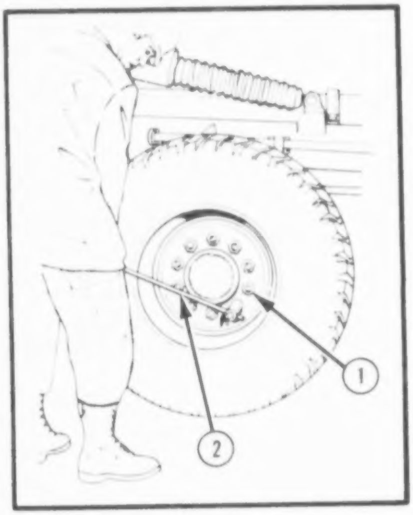
Step 1. Check road arm stops for buildup of foreign matter.

Clean with a rag (item 13, app D).

Step 2. Exercise wheels up and down several times (p 2-5).

If problem continues, notify organizational maintenance.

23 WHEELS WOBBLE OR ARE OUT OF LINE.



Step 1. Check for loose wheel nuts.

Tighten nuts (1), using prime mover lug nut wrench (2). Notify organizational maintenance to torque wheel nuts as soon as possible.

Step 2. Check for damaged wheel or hub.

If damaged, notify organizational maintenance.

Troubleshooting Table—Continued

MALFUNCTION
  TEST OR INSPECTION
    CORRECTIVE ACTION

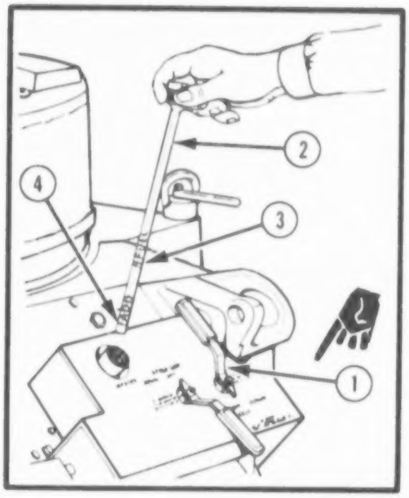
---

24 SPEED SHIFT ASSEMBLY CANNOT BE EXTENDED OR RETRACTED.

Step 1. Check to see if WHEELS lever (1) on manifold assembly is in UP or DOWN position.

Push down WHEELS lever and move to OFF position.

Step 2. Check hydraulic fluid level in manifold assembly by unscrewing and removing dipstick (2). Hydraulic fluid must be present between full mark (3) and add mark (4).



a. If hydraulic fluid is not between the full and add marks, fill as required (p 3-66).

b. If hydraulic fluid is at proper level and problem persists, notify organizational maintenance.

MALFUNCTION
    TEST OR INSPECTION
        CORRECTIVE ACTION

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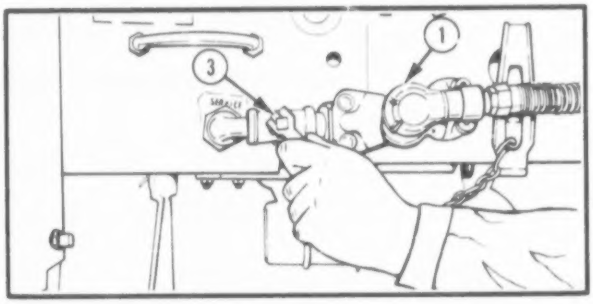
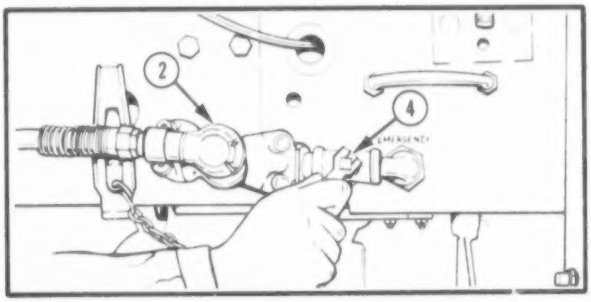
25 BRAKES ARE LOCKED.





Step 1. Check to be sure the service hose assembly (1) and the emergency hose assembly (2) are hooked up as shown.

Hook up hose assemblies correctly.

Step 2. Check to see if service and emergency air line cutout cocks on prime mover are fully open.

Open service air line cutout cock (3) and emergency air line cutout cock (4).

Step 3. Check for air leak in hose assembly.

If there is a leak in the hose assembly, notify organizational maintenance.

Troubleshooting Table—Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

25 BRAKES ARE LOCKED.—Continued

Step 4. Check condition of rubber seals in hose couplings.

If bad, notify organizational maintenance.

Step 5. Check for inadequate air source at prime mover.

Refer to prime mover TM for corrective procedures.

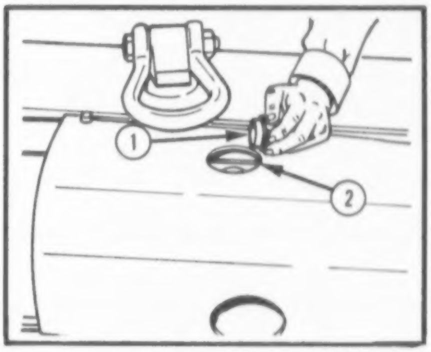
Step 6. Test brakes to see if they are still locked.

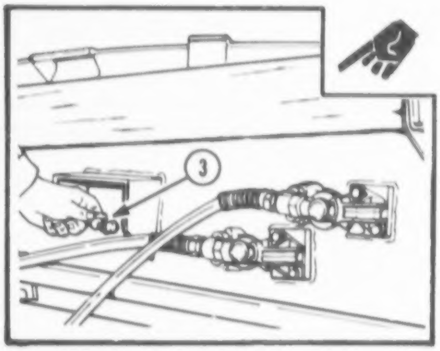
If problem continues, notify organizational maintenance.

26 BRAKES ARE WEAK.

Step 1. Check for inadequate air source at prime mover.

Refer to prime mover TM for corrective procedures.





Step 2. Check for low brake fluid level by removing fluid filler cap (1) from hydraulic reservoir (2). Fluid should be about 3/4 inch (1.90 cm) from top of the filling hole.

If brake fluid level is low, fill as required (p 3-70).

Step 3. Check to see that drain cock (3) is closed.

If open, close.

Troubleshooting Table – Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

FIRE CONTROL EQUIPMENT

27 MOISTURE IS IN FIRE CONTROL EQUIPMENT.

No further inspection is required.

Notify organizational maintenance.

28 COUNTERS, LEVEL VIALS, OR RETICLES ARE NOT ILLUMINATED.

Perform no further test or inspection.

WARNING

☢ **Put fire control equipment in plastic bag (item 1, app D), wash hands, and follow radioactive materials procedures on inside front cover of this manual. Notify organizational maintenance and the radiological protection officer.**

29 FIRE CONTROL KNOBS DO NOT TURN FREELY.

No further inspection is required.

Notify organizational maintenance.

30 COUNTER DIALS, RETICLES, OR LEVEL VIALS ARE BROKEN.

Perform no further test or inspection.

WARNING

☢ **Put fire control equipment in plastic bag (item 1, app D), wash hands, and follow radioactive materials procedures on inside front cover of this manual. Notify organizational maintenance and the radiological protection officer.**

30.1 FITTED PARTS OF FIRE CONTROL EQUIPMENT ARE LOOSE.

No further test or inspection is required.

Notify organizational maintenance.

Troubleshooting Table—Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

31 COLLIMATOR RETICLE IMAGE IS NOT SHARP.

Step 1. Check that M137 pantel is providing a clear image and is not dirty, wet, or fogged.

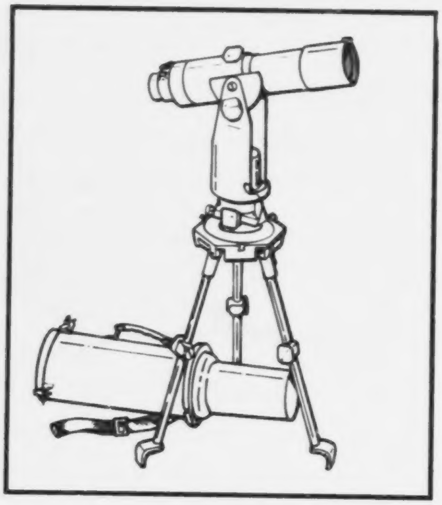
a. Clean, if necessary, with lens-cleaning compound (item 3, app D).

b. If cleaning does not solve the malfunction, notify organizational maintenance.

Step 2. Check to see if M137 pantel parallax shield is incorrectly positioned for best use of available light.

a. Adjust M137 pantel parallax shield as necessary.

b. If adjustment does not solve the malfunction, notify organizational maintenance.



Step 3. Check to see if collimator lenses are dirty, wet, or fogged.

Clean, if necessary, with lens-cleaning compound (item 3, app D).

Section III. MAINTENANCE PROCEDURES

3-3. GENERAL

a. **Responsibility.** The crew, supervised by the chief of section, is responsible for crew maintenance of the M198 howitzer.

b. **Repairs.** Repairs will be limited to those listed in this manual.

c. **Tools.** Tools required to maintain the weapon are listed in appendix B.

d. **Inspection and services.** All inspections and services of the M198 howitzer are covered in this section. Tasks which affect operational readiness are also in the PMCS table and are to be performed at intervals as indicated in the PMCS table. Other inspections and services which do not significantly impact operational readiness but are recommended to keep the howitzer in top working order are included in this section.

3-4. CANNON MAINTENANCE

Cannon maintenance consists of inspecting, servicing, and repairing authorized items (app B).

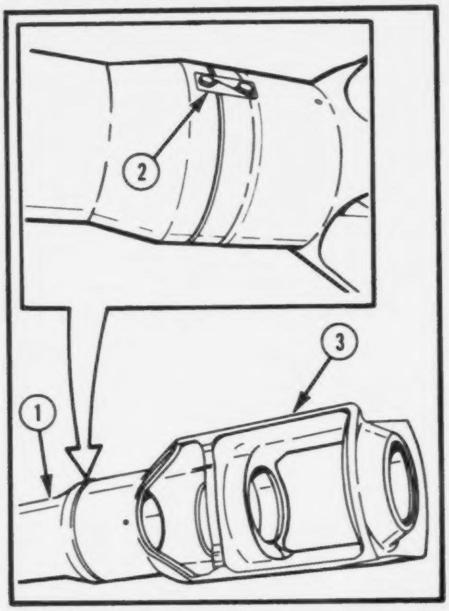
CANNON MAINTENANCE

INSPECTION

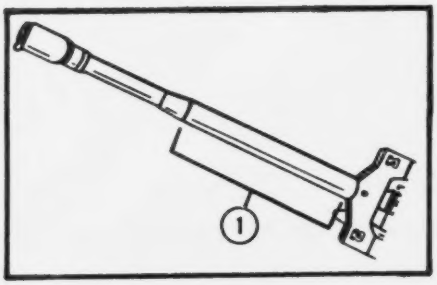
1 Weekly inspect for moisture, rust, corrosion, or foreign matter. Clean with CLP (item 1.1, app D), wipe dry, and lube with CLP.

2 Weekly check for loose bolts and missing or damaged parts, especially cannon tube (1) and muzzle brake key (2). Notify organizational maintenance if parts are loose, missing, or damaged.

3 After firing, inspect muzzle brake (3) for rust, corrosion, or foreign matter. Check for cracks over 1 inch (2.54 cm) long. Notify organizational maintenance if cracks are over 1 inch (2.54 cm).



4 Monthly inspect cannon tube (1) for presence of dark film lubricant. If loose or flaking, clean only the affected area with a crocus cloth (item 5, app D) and apply WTR (item 9, app D).



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CANNON MAINTENANCE—Continued

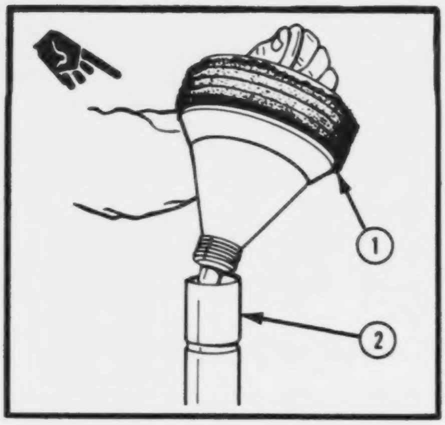
NOTE

For nonfiring periods cannon tube and breech mechanism assembly are cleaned and lubricated on a weekly basis.

SERVICING

1 Depress cannon tube to approximately +50 mils and open breechblock assembly.

2 Assemble cleaning brush (1) to staff section (2).



3 Clean and lubricate the cannon tube (see PMCS table (p 2-14)).

4 Deleted.

REPAIR

Repair by replacing authorized items (app B).

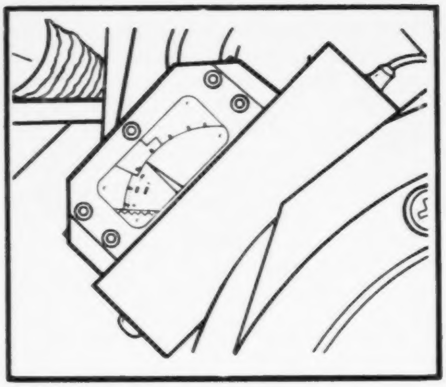
THERMAL WARNING DEVICE MAINTENANCE

INSPECTION

1. Check for moisture inside TWD (fogging of window).

2. Check operation of TWD. Pointer should show approximate outside temperature before firing and tube temperature during firing.

3. If defective, notify organizational maintenance.

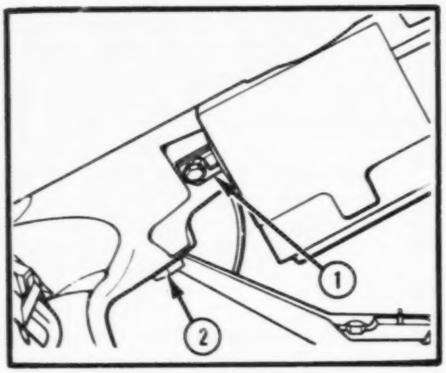


BREECH MECHANISM ASSEMBLY MAINTENANCE

INSPECTION

1. Weekly check ease of operation of the breech mechanism assembly. Breechblock assembly should open and close with equal effort. If not, notify organizational maintenance.

2. Check for loose bolts and missing or damaged parts on breech mechanism assembly, especially the torque key (1) and tube lock key (2). If bolts are loose or missing, and parts are damaged, notify organizational maintenance.

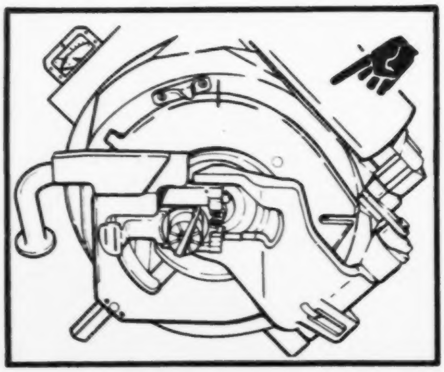


SERVICING

Weekly clean any foreign material or burrs from sliding surfaces. Perform necessary lubrication (LO 9-1025-211-13).

REPAIR

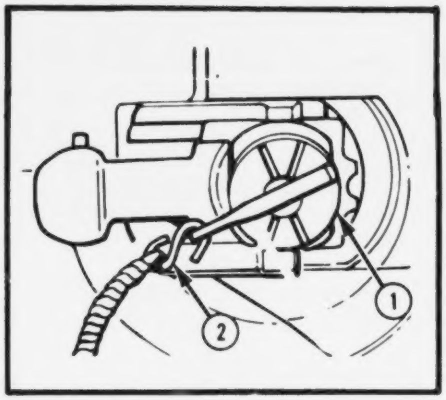
Repair is by replacement of authorized items (app B).



FIRING MECHANISM MAINTENANCE

TESTING

Place firing mechanism (1) in firing position, and check for proper operation by manually tripping the lanyard lever (2). A loud snap should be heard. If not, follow troubleshooting procedures (p 3-18).

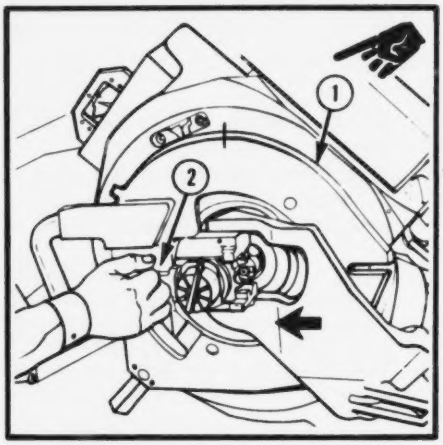


NOTE

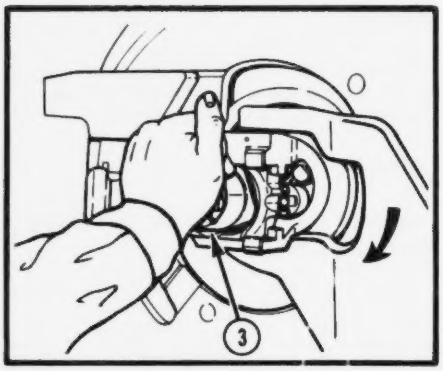
Disassembly/reassembly procedures are given for cleaning and inspecting purposes only. Crew is authorized to replace firing mechanism and firing mechanism block assembly.

REMOVAL

1 **With breechblock assembly (1) closed, move firing mechanism block assembly (2) to the left.**



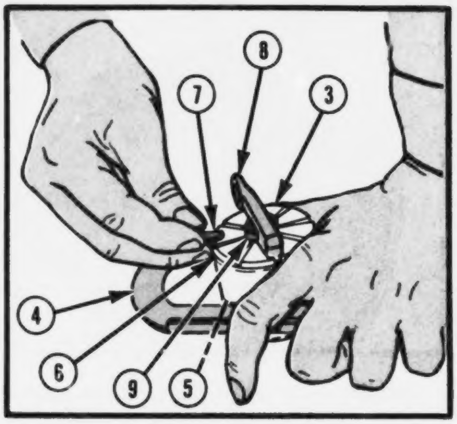
2 **Press in on firing mechanism (3) and turn it approximately 1/4 turn clockwise to remove.**

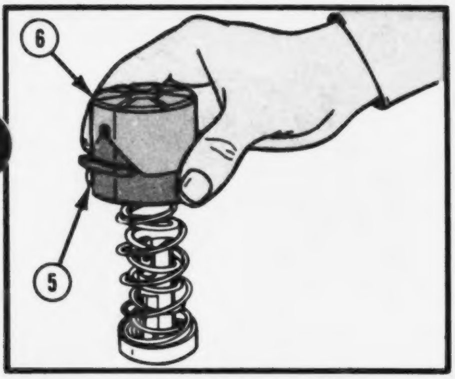


FIRING MECHANISM MAINTENANCE—Continued

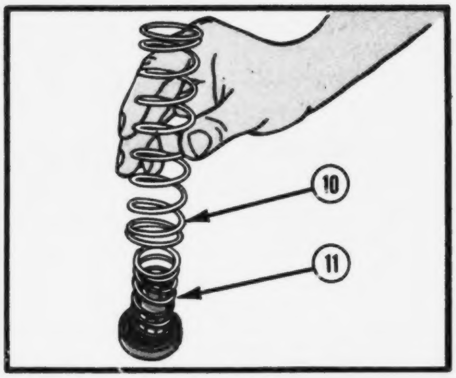
DISASSEMBLY

1 Place firing mechanism (3) on solid surface. Place M18 fuzesetter wrench (4) over the case (5) and follower (6) and depress until pin (7) can be removed from lanyard lever (8) and yoke (9). Release spring tension slowly. Lift off lanyard lever.



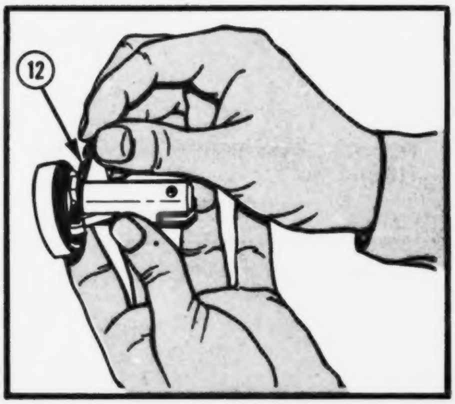


2 Remove and separate case (5) and follower (6).

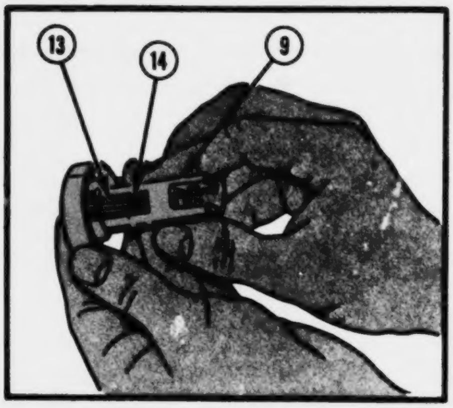


3 Remove cup spring (10) and yoke spring (11).

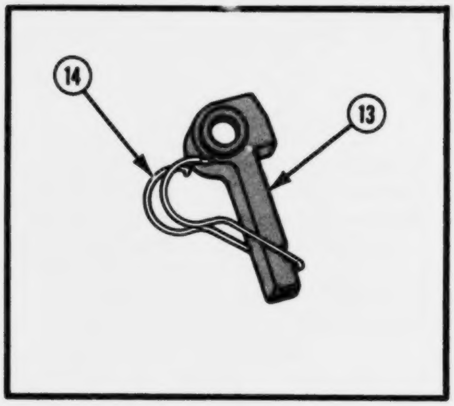
4 Remove sear pin (12).



FIRING MECHANISM MAINTENANCE--Continued

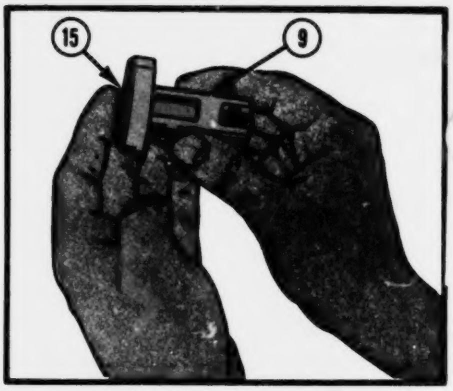


5 Remove sear (13) with firing hammer spring (14) from yoke (9).

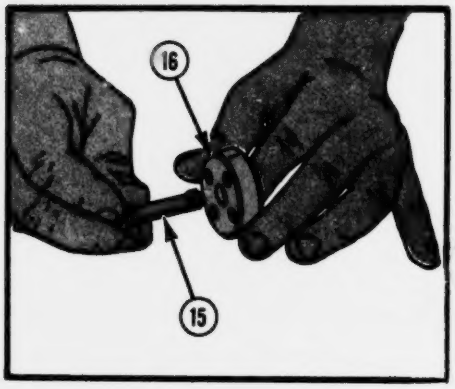


6 Separate sear (13) and firing hammer spring (14).

7 Remove yoke (9) from firing hammer (15).

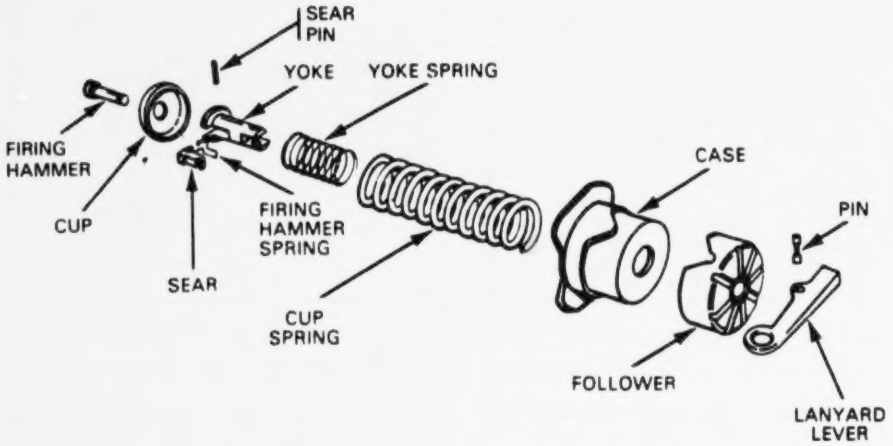


8 Remove firing hammer (15) from cup (16).



FIRING MECHANISM MAINTENANCE—Continued

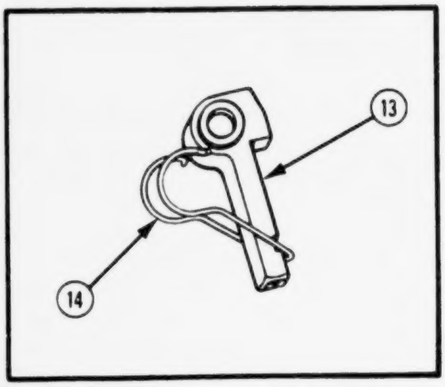
SERVICING AND INSPECTION


SEAR PIN
YOKE
YOKE SPRING
FIRING HAMMER
CUP
SEAR
FIRING HAMMER SPRING
CUP SPRING
CASE
PIN
FOLLOWER
LANYARD LEVER

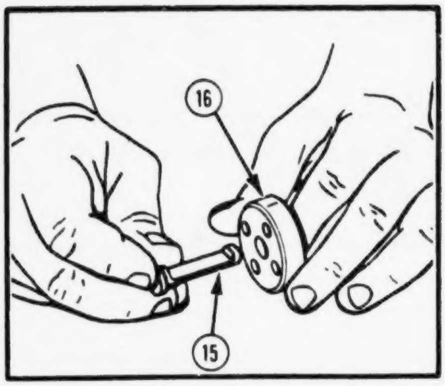
1 Clean all parts with CLP (item 1.1, app D), wipe dry, and lubricate with CLP (item 1.1, app D).

2 Inspect for damaged or worn parts. If any defective parts are found, replace entire firing mechanism assembly (item 15, app B) and notify organizational maintenance of defective assembly.

REASSEMBLY

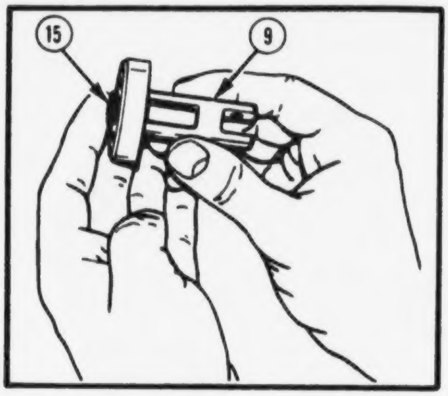


1 Put firing hammer spring (14) on sear (13).

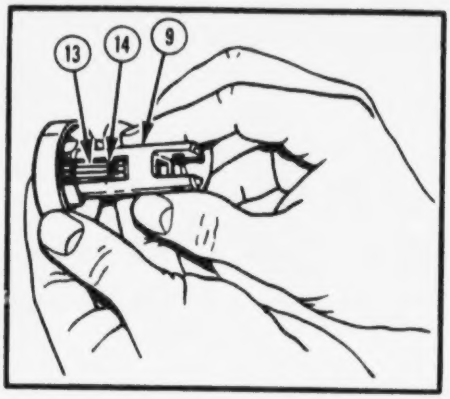


2 Place cup (16) on firing hammer (15).

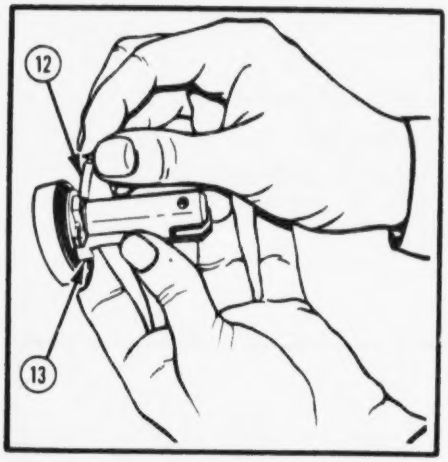
FIRING MECHANISM MAINTENANCE—Continued



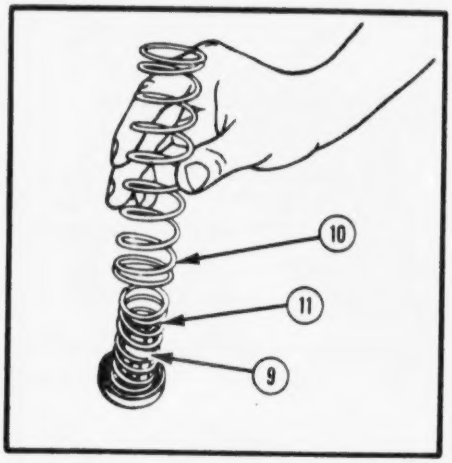
3 Place yoke (9) on firing hammer (15).



4 Place sear (13) with firing hammer spring (14) into yoke (9).

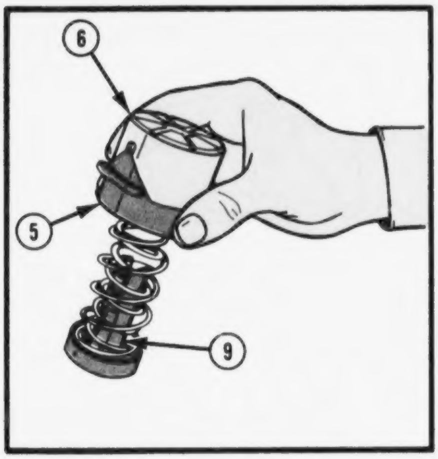


5 Secure sear (13) with sear pin (12).

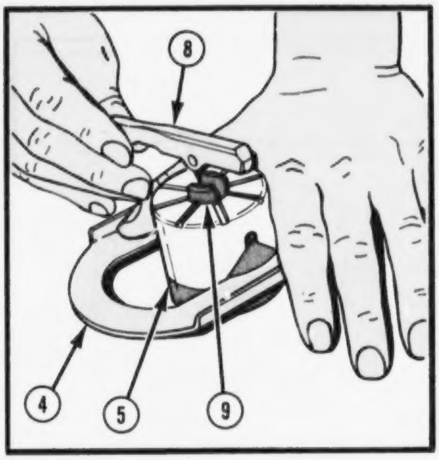


6 Place yoke spring (11) on yoke (9), and place cup spring (10) over yoke spring.

FIRING MECHANISM MAINTENANCE—Continued

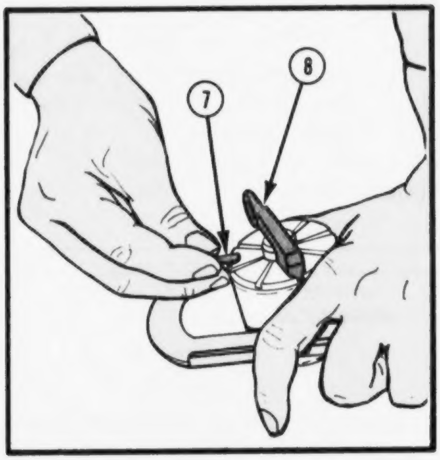


7 Slide follower (6) over case (5), and place over assembled yoke (9).



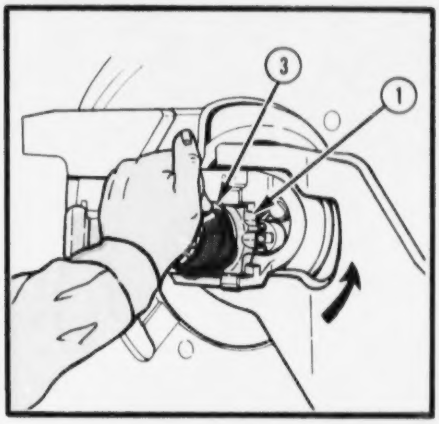
8 With assembled parts on solid surface, put M18 fuze-setter wrench (4) over case (5), depress, and hold down. Place lanyard lever (8) in yoke (9).

9 Secure lanyard lever (8) with pin (7).

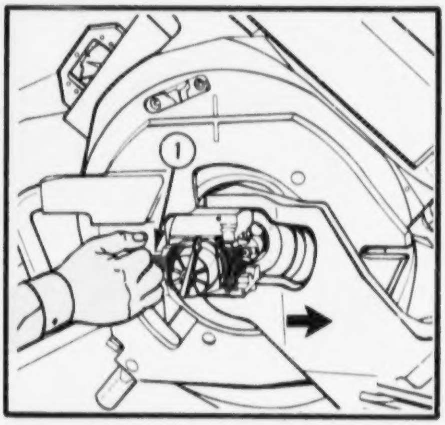


FIRING MECHANISM MAINTENANCE—Continued

INSTALLATION



1 Place firing mechanism (3) in firing mechanism block assembly (1), press in, turn it 1/4 turn counterclockwise, and release.



2 Slide firing mechanism block assembly (1) to the right.

FIRING MECHANISM BLOCK ASSEMBLY MAINTENANCE

NOTE

Procedures are given for cleaning and inspecting purposes only. Crew is only authorized to replace firing pin, firing mechanism block assembly, or firing mechanism.

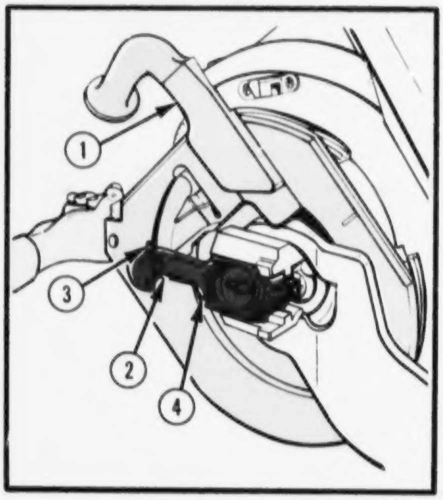
REMOVAL

NOTE

If only the firing pin is to be removed, steps 1 and 2 do not have to be followed.

1 Rotate breechblock assembly (1) until slot (2) is in the horizontal position.

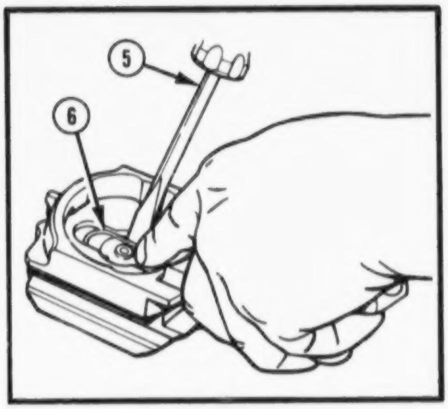
2 Pull out on spring pin (3) and slide firing mechanism block assembly (4) to the right and remove.



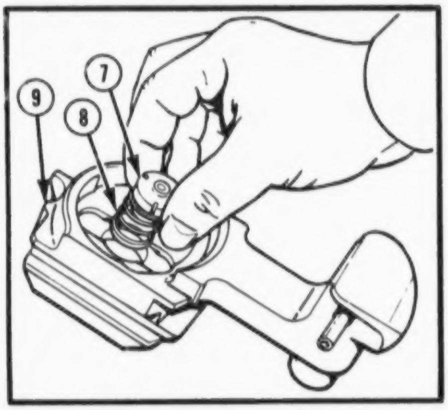
FIRING MECHANISM BLOCK ASSEMBLY MAINTENANCE—Continued

DISASSEMBLY

1 Using a small flat-tip screwdriver (5), remove the firing pin retainer (6).



2 Remove firing pin (7) and firing pin spring (8) from firing mechanism block (9).

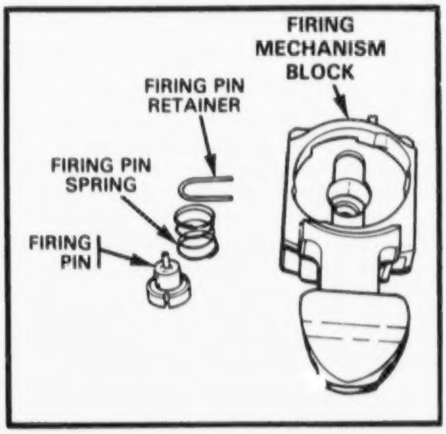


SERVICING AND INSPECTION

1 Monthly clean all parts with CLP (item 1.1, app D).

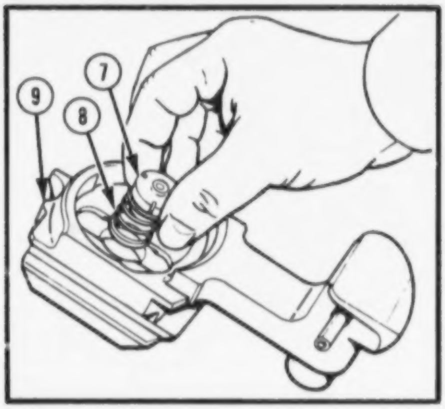
2 Inspect each part for damage. If firing pin is defective, replace (item 32, app B). If any other parts are damaged or missing, replace entire firing mechanism block assembly (item 15.1, app B).

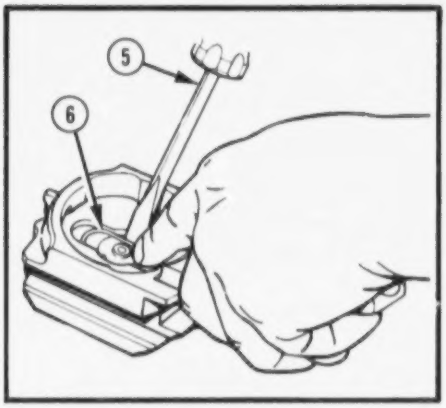
3 Wipe dry and apply a light coat of CLP (item 1.1, app D).


FIRING MECHANISM BLOCK
FIRING PIN RETAINER
FIRING PIN SPRING
FIRING PIN

FIRING MECHANISM BLOCK ASSEMBLY MAINTENANCE—Continued

REASSEMBLY

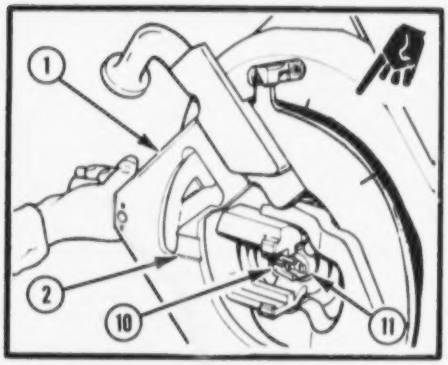


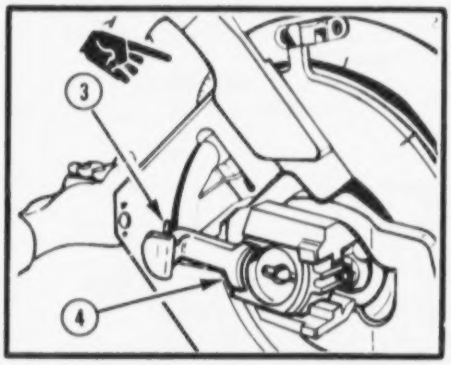


1 Install firing pin spring (8) and firing pin (7) into firing mechanism block (9).

2 Install firing pin retainer (6), using a small flat-tip screwdriver (5).

INSTALLATION

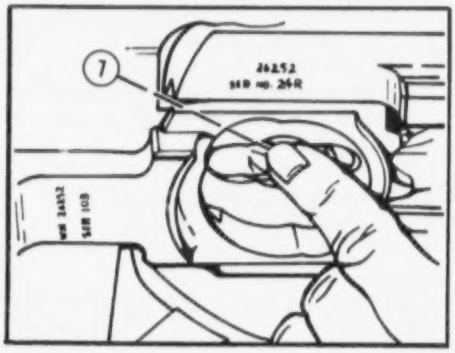




1 Rotate breechblock assembly (1) until slot (2) is in the horizontal position. Make sure extractor (10) is up against the obturator spindle assembly (11).

2 Pull out on spring pin (3), install firing mechanism block assembly (4), and slide it to the left.

3 Test action of firing pin (7) by pushing in on rear of firing pin. Release firing pin; it should return with spring action.



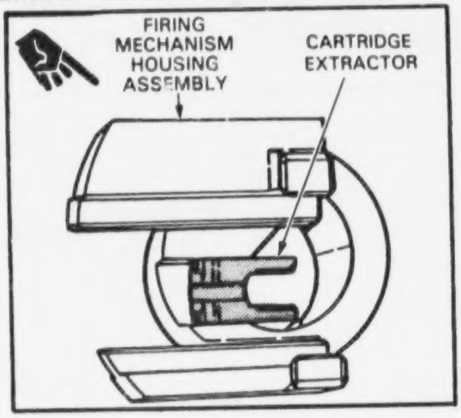
FIRING MECHANISM HOUSING ASSEMBLY MAINTENANCE

INSPECTION

Remove (p 3-44), and inspect for nicks, dirt, burrs, or missing parts. Notify organizational maintenance if parts are missing.

SERVICING

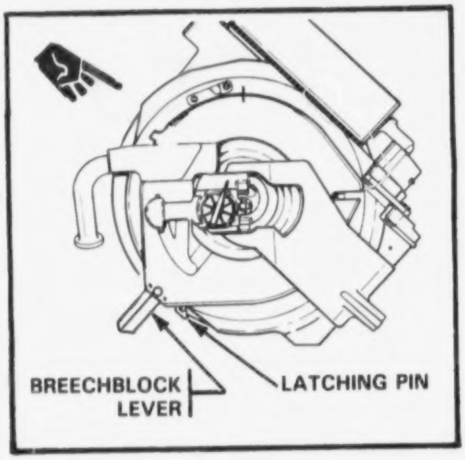
Monthly, clean with CLP (item 1.1, app D). Wipe dry, and apply a light coat of CLP (item 1.1, app D) on all surfaces, including cartridge extractor.



OBTURATOR SPINDLE ASSEMBLY AND PARTS MAINTENANCE

CAUTION

It is not advisable to park or store howitzer with the obturator spindle assembly or parts removed. However, if local procedures dictate the removal of the obturator spindle assembly and parts from the breechblock assembly during storage or parking, caution should be exercised in closing the breechblock assembly to prevent rotation beyond the fully closed position and possible breaking of the breechblock lever.

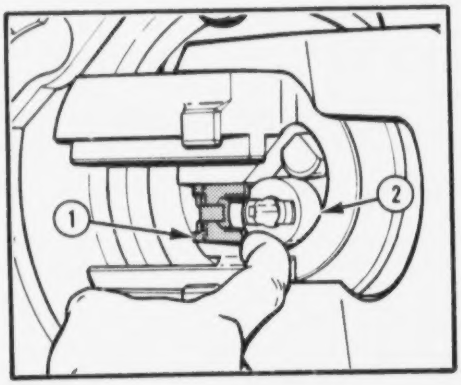


NOTE

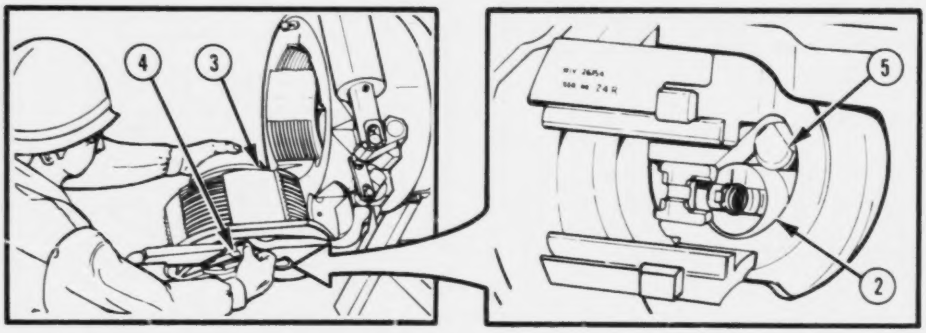
Removal/installation procedures are given for cleaning and inspecting purposes only. Crew is only authorized to replace obturator pad and front split ring.

REMOVAL

1 Lift cartridge extractor (1) away from obturator spindle assembly (2) (toward you).



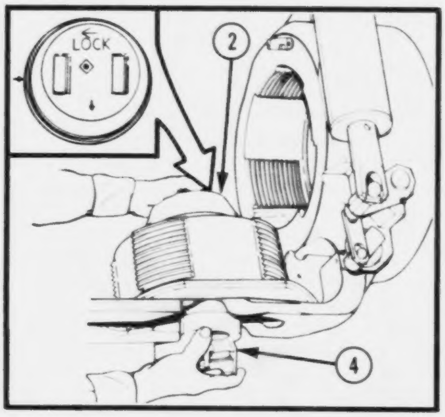
OBTURATOR SPINDLE ASSEMBLY AND PARTS MAINTENANCE—Continued



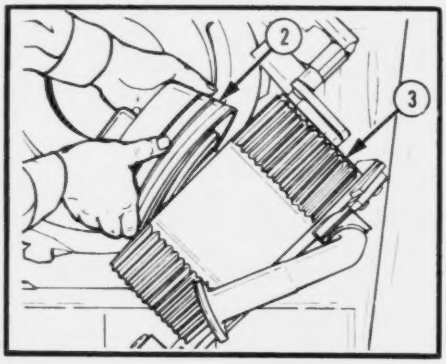
2 With breechblock assembly (3) open, support firing mechanism housing assembly (4) and depress plunger (5) in end of obturator spindle assembly (2).

NOTE

Deleted.

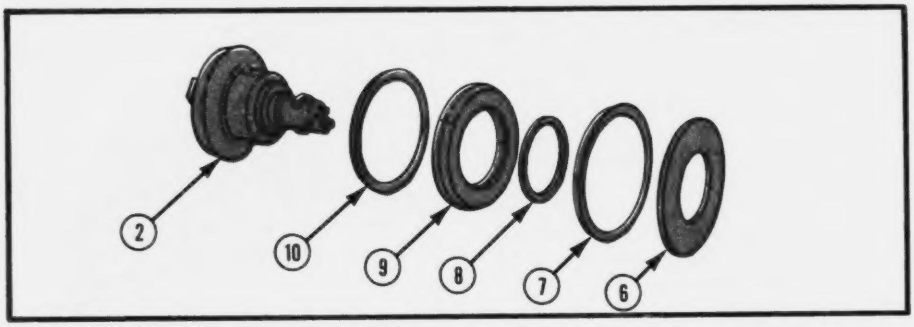


3 With plunger (5) depressed, turn obturator spindle assembly (2) clockwise (opposite direction of arrow on obturator spindle assembly) until firing mechanism housing assembly (4) can be removed.



4 Lift obturator spindle assembly (2) off breechblock assembly (3).

OBTURATOR SPINDLE ASSEMBLY AND PARTS MAINTENANCE—Continued



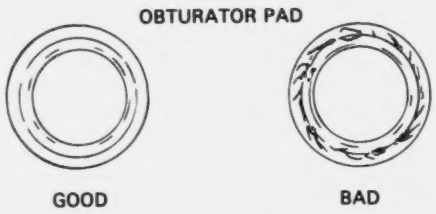
5 Remove disk (6), rear split ring (7), inner ring (8), obturator pad (9), and front split ring (10) from obturator spindle assembly (2).

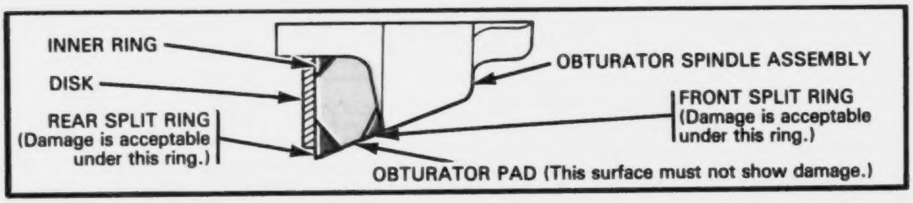
SERVICING AND INSPECTION

CAUTION

Do not clean obturator pad with RBC. Use soap (item 14, app D) and water.

1 Inspect obturator pad for evidence of leakage past sealing surfaces of obturator pad.


OBTURATOR PAD
GOOD
BAD


INNER RING
DISK
REAR SPLIT RING (Damage is acceptable under this ring.)
OBTURATOR SPINDLE ASSEMBLY
FRONT SPLIT RING (Damage is acceptable under this ring.)
OBTURATOR PAD (This surface must not show damage.)

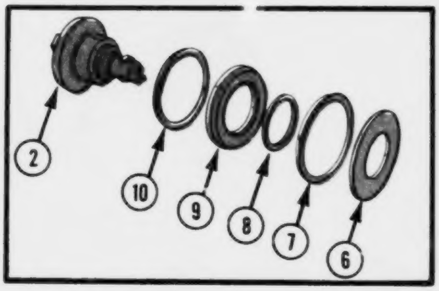
2 Gouges in the surface between obturator pad and split ring mating surfaces are normal and will not hinder operation, unless gouging is over 50 percent of obturator pad.

3 If there is indication of leakage past breech ring assembly, replace obturator pad.

4 Inspect obturator spindle assembly and split rings for burrs or cracks. If burrs or cracks are present, notify organizational maintenance.

OBTURATOR SPINDLE ASSEMBLY AND PARTS MAINTENANCE—Continued

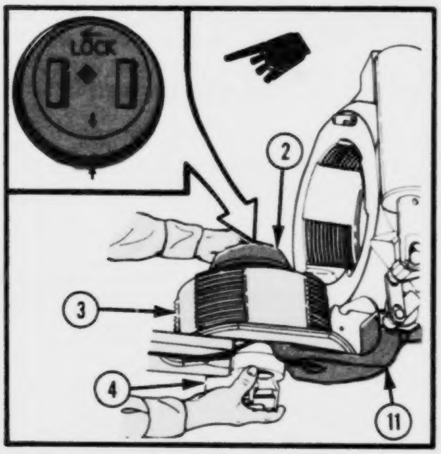
INSTALLATION



NOTE

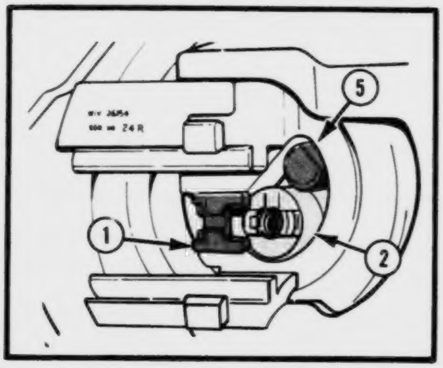
When installing split rings, be sure splits on front split ring (10) and rear split ring (7) are opposite (180 degrees apart).

1 Install front split ring (10), obturator pad (9), inner ring (8), rear split ring (7), and disk (6) on obturator spindle assembly (2).



2 Place assembled obturator spindle assembly (2) into breechblock assembly (3) and carrier (11) so that arrow on obturator spindle assembly lines up with arrow on breechblock assembly.

3 While supporting firing mechanism housing assembly (4), turn obturator spindle assembly (2) counterclockwise (in direction of arrow on obturator spindle assembly) until plunger on end of obturator spindle assembly (2) is fully locked.



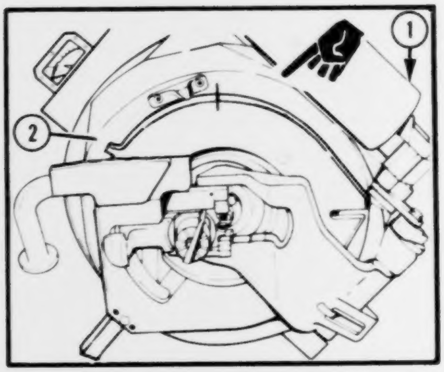
4 Close breechblock assembly and make sure plunger (5) on obturator spindle assembly (2) is in the fully locked position.

5 Push cartridge extractor (1) towards obturator spindle assembly (2).

BREECH COUNTERBALANCE MAINTENANCE

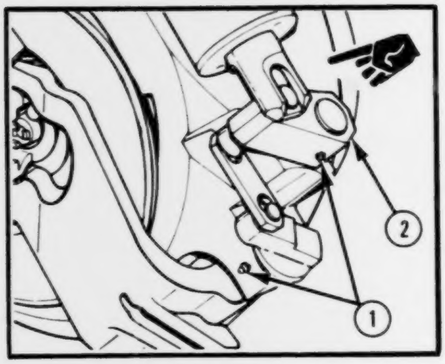
INSPECTION

Check operation of breech counterbalance (1) by opening and closing breechblock assembly (2). Breechblock assembly should open and close with equal effort. If not, notify organizational maintenance.



SERVICING

Monthly, apply WTR grease (item 9, app D) to two lube fittings (1) on breech hinge pin assembly (2).



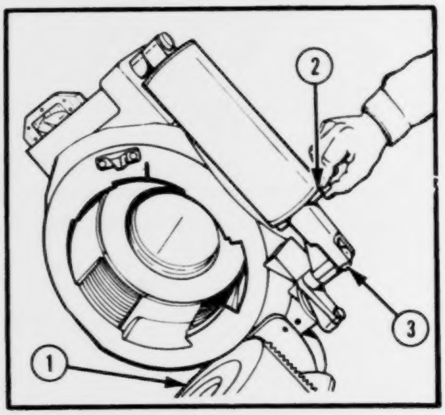
BREECHBLOCK ASSEMBLY MAINTENANCE

NOTE
Removal/installation procedures are given for cleaning and inspecting purposes only.

REMOVAL

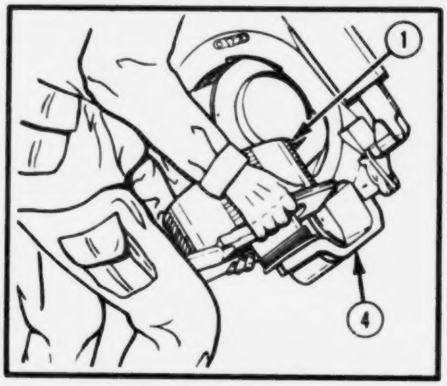
WARNING
Before removing breechblock assembly (1), install suitable pin (2) (item 32.1, app B) in breech counterbalance (3).

Breechblock assembly (1) weighs approximately 128 pounds (58.05 kg). Use care when removing or installing.



BREECHBLOCK ASSEMBLY MAINTENANCE—Continued

Lift breechblock assembly (1) from carrier (4) while other crewman holds down carrier by grasping inner lip of carrier. Place breechblock assembly on a solid surface.

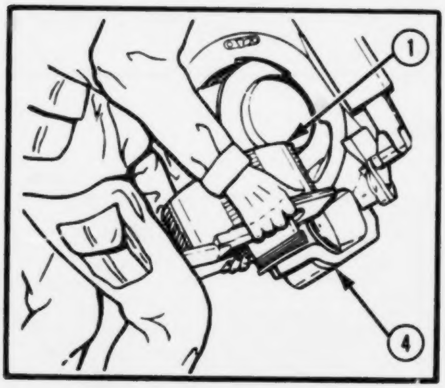


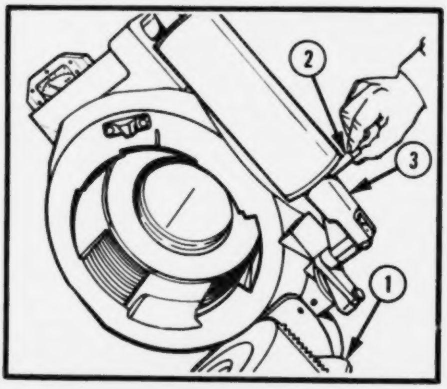
SERVICING AND INSPECTION

1 Weekly, perform necessary lubrication (LO 9-1025-211-13).

2 Inspect threads for burrs. Remove with crocus cloth (item 5, app D).

INSTALLATION





1 Lift breechblock assembly (1) and position on carrier (4).

2 Remove pin (2) from breech counterbalance.

3 After reassembling breech mechanism assembly, open and close breechblock assembly (1) to make sure it opens and closes with equal effort.

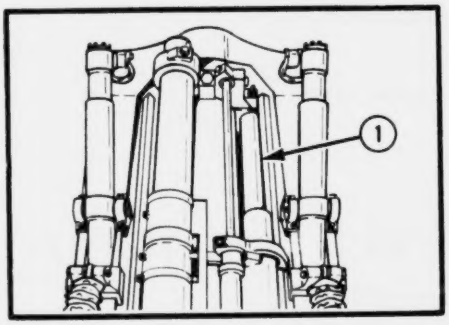
3-5. RECOIL MECHANISM MAINTENANCE

Recoil mechanism maintenance consists of inspection and servicing procedures as follows:

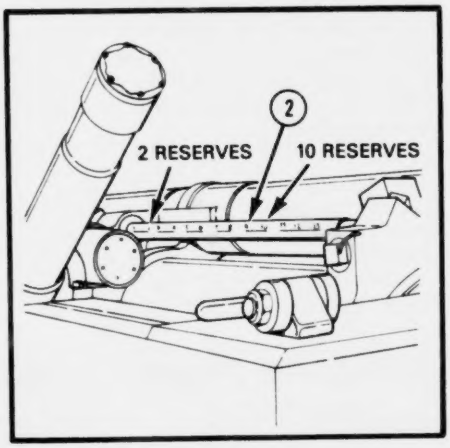
RECOIL MECHANISM MAINTENANCE

INSPECTION

1 Check recoil mechanism for oil leakage. Leakage from back of recoil cylinder assemblies (1) is considered normal unless leakage is over two reserves per day during firing. If leakage is from other points or is more than two reserves per day, notify organizational maintenance.



2 Check that oil reserve indicator (2) is on or between two and 10 reserves. If not, notify organizational maintenance.



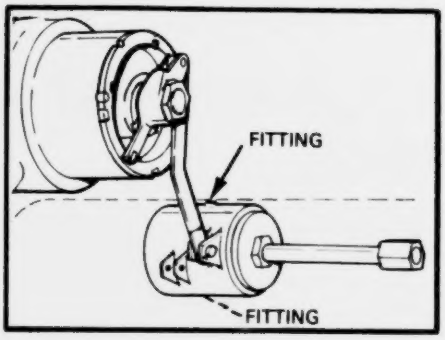
3 Check for smooth operation, length of recoil (p 1-12), and complete movement to battery without shock. If defective, notify organizational maintenance.

SERVICING

See servicing procedures of the following subassemblies.

SLEEVE BEARING ASSEMBLY MAINTENANCE

INSPECTION



Check for broken or missing parts. If parts are broken or missing, notify organizational maintenance.

SERVICING

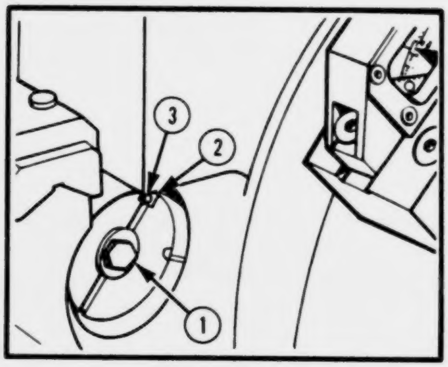
Monthly, lube fittings with WTR grease (item 9, app D).

RECOIL CYLINDER ASSEMBLIES MAINTENANCE

INSPECTION

1 Check recoil cylinder assemblies for oil leakage. Leakage from the back is considered normal unless it is over two reserves per day. If leakage is from other points or is more than two reserves per day, notify organizational maintenance.

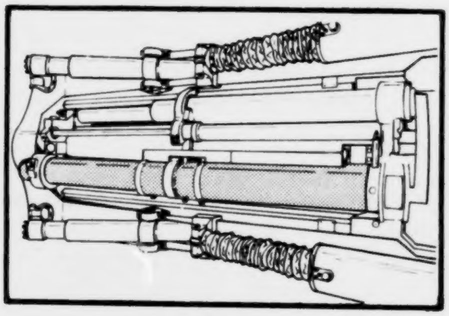
2 Using a rag (item 13, app D) and cleaning compound (item 2, app D), clean all foreign material from safety relief valves (1) at rear of recoil cylinder assemblies. Check for presence of retainer (2) and screw (3).



RECUPERATOR CYLINDER ASSEMBLY MAINTENANCE

INSPECTION

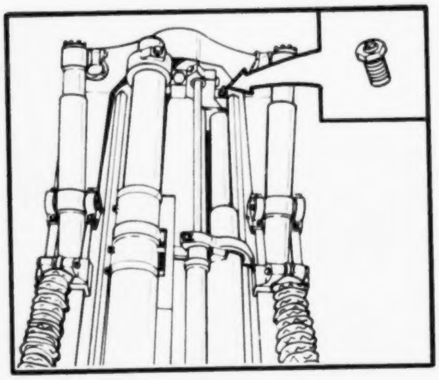
Check for oil leakage. If leaking, notify organizational maintenance.



OIL VALVE ASSEMBLY MAINTENANCE

INSPECTION

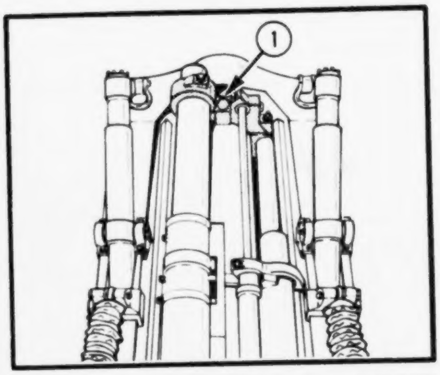
Check for oil leakage. If leaking, notify organizational maintenance.



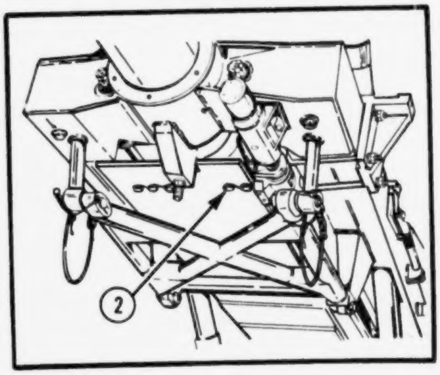
RECOIL YOKE ASSEMBLY (FRONT) MAINTENANCE

INSPECTION

1 Check for oil leakage at recoil yoke assembly (front) (1). If leaking, notify organizational maintenance.



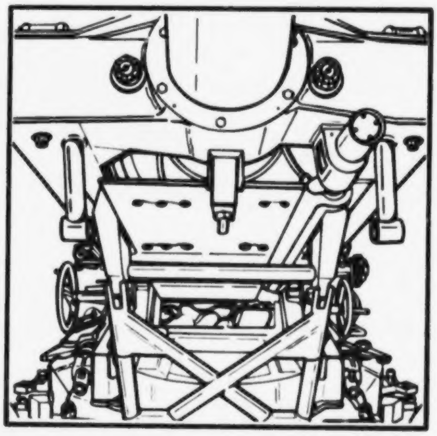
2 **Check for presence of lock wire on recoil yoke assembly (front) screws (2). Do not tighten screws. Notify organizational maintenance if lock wire is missing.**



RECOIL YOKE ASSEMBLY (MIDDLE) MAINTENANCE

INSPECTION

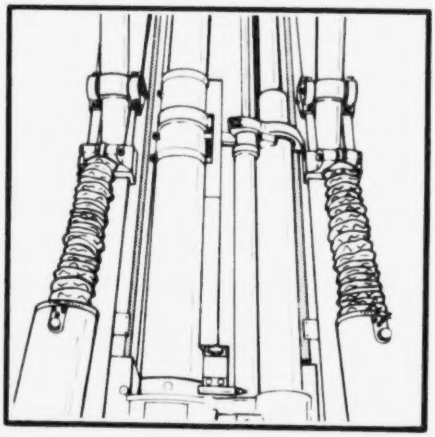
Check for presence of lock wire on recoil yoke assembly (middle) screws. Do not tighten screws. Notify organizational maintenance if lock wire is missing.



RECOIL MECHANISM RAILS MAINTENANCE

INSPECTION

Inspect from top to bottom for burrs, nicks, and cracks. If burred, nicked, or cracked, notify organizational maintenance.



SERVICING

Using a rag (item 13, app D), clean firing residue from recoil mechanism rails.

3-6. CARRIAGE MAINTENANCE

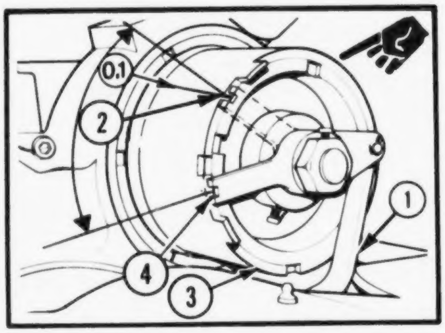
Carriage maintenance consists of inspecting and servicing as follows:

CARRIAGE MAINTENANCE

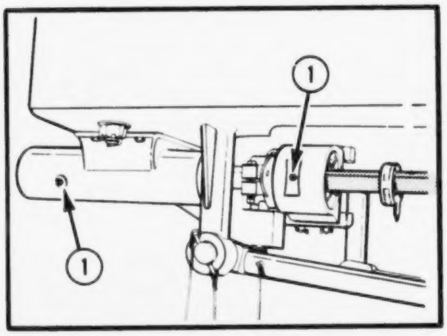
INSPECTION

1 Check carriage for any unusual or excessive noise that may be caused by improper adjustment, worn or loose parts, lack of lubricant, foreign matter, or moisture. Lube according to lube instructions (LO 9-1025-211-13).

NOTE
To observe the 55-degree mark from the ground, right side of weapon, apply a chalk mark (0.1) on the outside diameter of the recuperator cylinder.



2 Check for proper operation of variable recoil rigid connecting link (1) by elevating and depressing weapon (p 2-2) throughout the elevation range. The 55-degree (from vertical) scribe line (2) on end of recuperator cylinder (3) should lie within notch on end of lever (4) when the cannon is at 1025 mils elevation or more. If not, notify organizational maintenance.



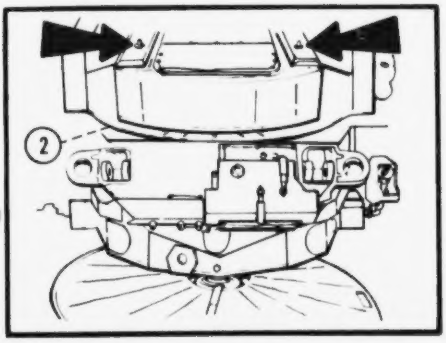
SERVICING

1 Monthly, add WTR grease (item 9, app D) to lube fittings (1).

NOTE
Arrows indicate lube points.

2 Monthly lube traversing internal gear bearing (2) and gear set with WTR grease (item 9, app D) while traversing.

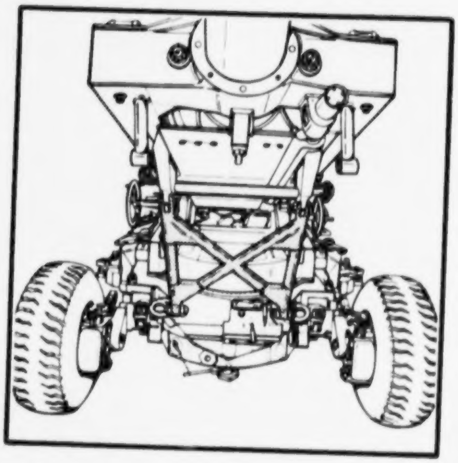
3 Deleted.



TRAVEL LOCK ASSEMBLY MAINTENANCE

INSPECTION

Check travel lock pin receivers for dirt, burrs, and scoring.



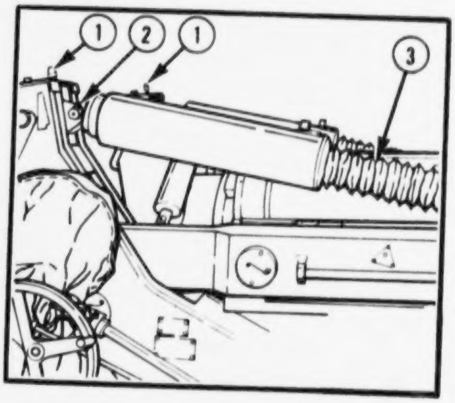
SERVICING

Clean travel lock pin receivers with rag (item 13, app D).

EQUILIBRATOR CYLINDERS MAINTENANCE

INSPECTION

Weekly, inspect for moisture or foreign matter in top carriage recesses around or on equilibrator adjusting screws (1) and for leakage on both ends of bellows (3). If leakage is present, notify organizational maintenance.



SERVICING

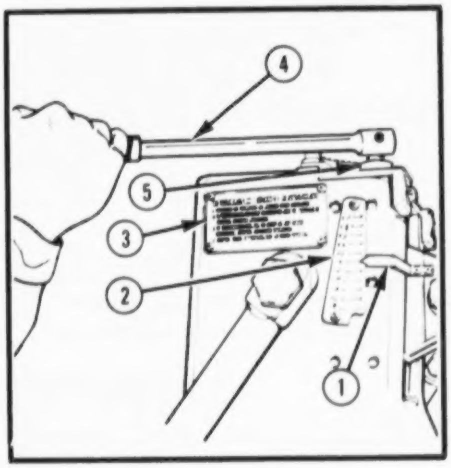
1 Remove with rag (item 13, app D) any foreign matter in top carriage recesses around or on equilibrator adjusting screws (1). Weekly coat with WTR grease (item 9, app D).

2 Monthly lube equilibrator bolts (2) with WTR grease (item 9, app D).

EQUILIBRATOR CYLINDERS MAINTENANCE—Continued

ADJUSTMENT

1 With weapon on its firing baseplate, elevate or depress cannon tube (p 2-2) to 375 mils elevation.



NOTE

Raising the dial pointer (1) on the scale (2) will decrease effort required to elevate weapon. Lowering the dial pointer will increase the effort required to elevate weapon. An instruction plate (3) is provided as an aid in this adjustment.

2 Insert socket wrench handle (4) into socket in adjusting screw (5). Turn adjusting screw clockwise or counterclockwise to raise or lower dial pointer (1) on the scale (2).

3 Make the same adjustment on both scales (2) by moving one number at a time until proper adjustment is made.

4 Once you have made the adjustment, operate the elevating handwheel (p 2-2) to ensure weapon will elevate and depress with approximately the same amount of effort. If there is not an equal effort between elevation and depression, notify organizational maintenance.

CRADLE ASSEMBLY MAINTENANCE

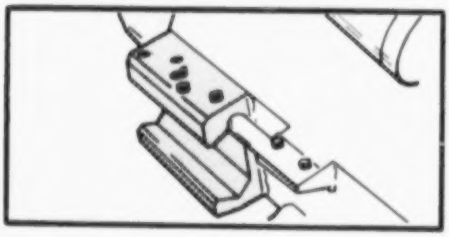
INSPECTION

Check for loose or missing parts. If parts are loose or missing, notify organizational maintenance.

GUIDE ASSEMBLY MAINTENANCE

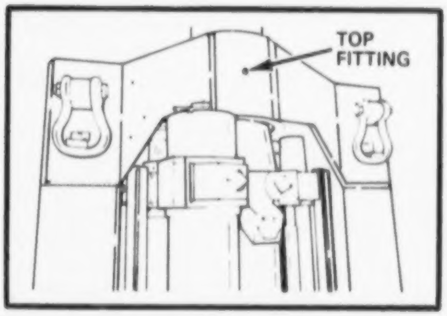
SERVICING

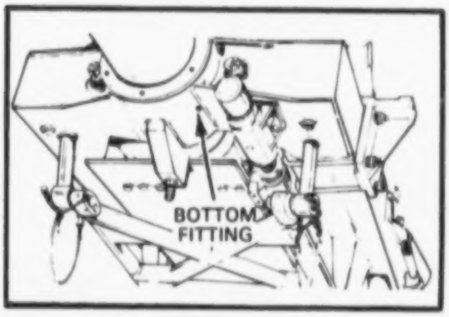
Lube guide assembly daily after firing or monthly with WTR grease (item 9, app D).



BEARING UNIT HOUSING MAINTENANCE

SERVICING

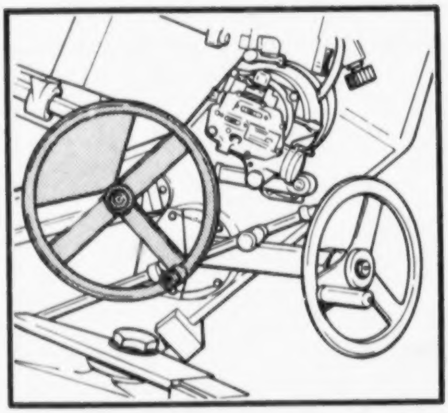




Lube bearing unit housing monthly with WTR grease (item 9, app D).

HANDWHEEL (ELEVATING) MAINTENANCE

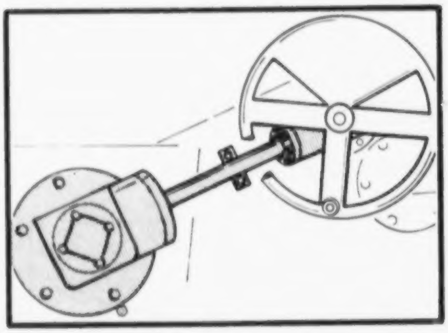
INSPECTION



1 Weekly, check handwheel for smooth operation, making sure there is no binding or jerking motion and that backlash is not more than 1/12 turn (4-1/4 in. (10.79 cm)). If more than 1/12 turn, notify organizational maintenance.

ANGLE DRIVE UNIT (ELEVATING) MAINTENANCE

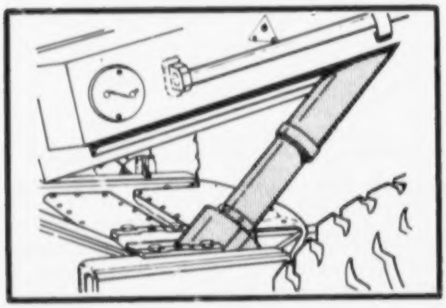
INSPECTION



Inspect for loose or missing parts or cracks on both housings on each side. If parts are loose, missing, or cracked, notify organizational maintenance.

ELEVATING SCREW ASSEMBLY MAINTENANCE

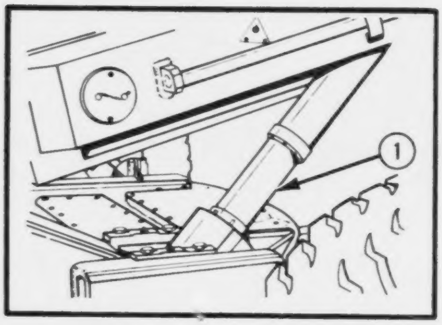
INSPECTION

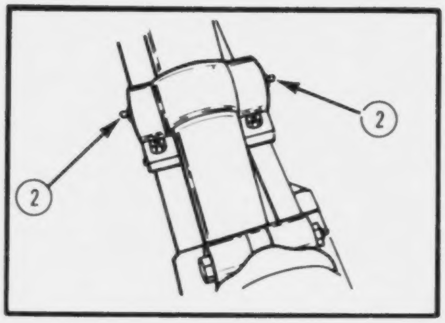


Inspect the exposed cylinders of the elevating screw assemblies for dirt, burrs, and scoring.

ELEVATING SCREW ASSEMBLY MAINTENANCE—Continued

SERVICING





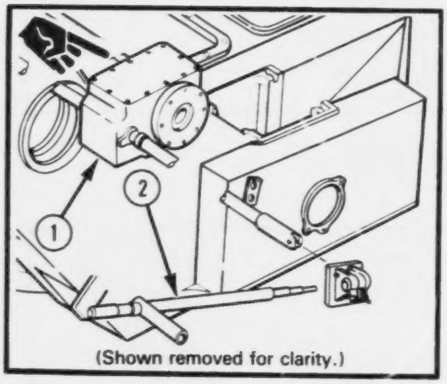
1 Clean exposed cylinders of the elevating screw assemblies (1) with rags (item 13, app D).

2 Monthly lube elevating mechanism trunnion fittings (2) with WTR grease (item 9, app D).

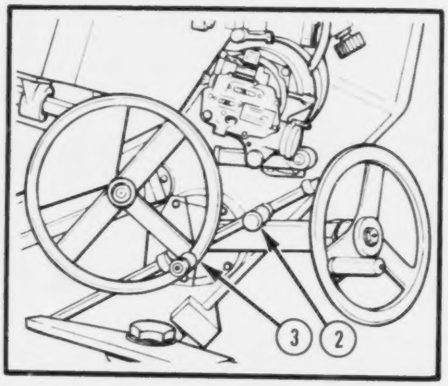
3 Deleted.

FRICTION CLUTCH MAINTENANCE

INSPECTION



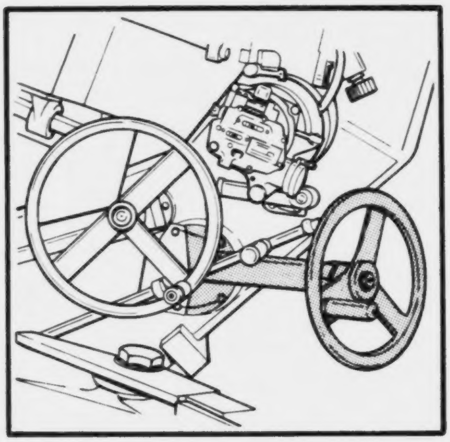
(Shown removed for clarity.)



Check operation of friction clutch (1). Depress the manual control lever (2), and elevate and depress the gun tube. Release the manual control lever. Handwheel (elevating) (3) should not turn. Releasing the manual control lever will lock the elevating mechanism. If the friction clutch is not operating properly, notify organizational maintenance.

HANDWHEEL (TRAVERSING) MAINTENANCE

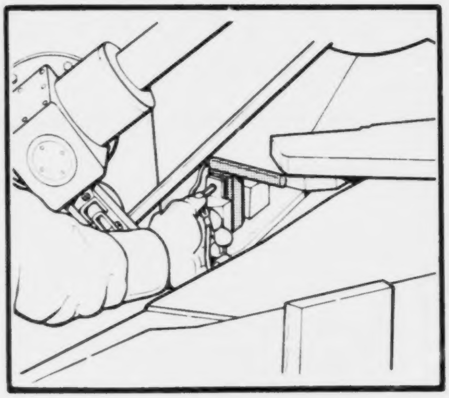
INSPECTION



Weekly, check for smooth operation, making sure there is no binding or jerking motion and the backlash of the handwheel is not more than 1/12 turn (3-1/8 in. (7.94 cm)). If more than 1/12 turn, notify organizational maintenance.

TOP CARRIAGE MAINTENANCE

INSPECTION



1 Inspect top carriage locking pin receivers for dirt, burrs, and scoring.

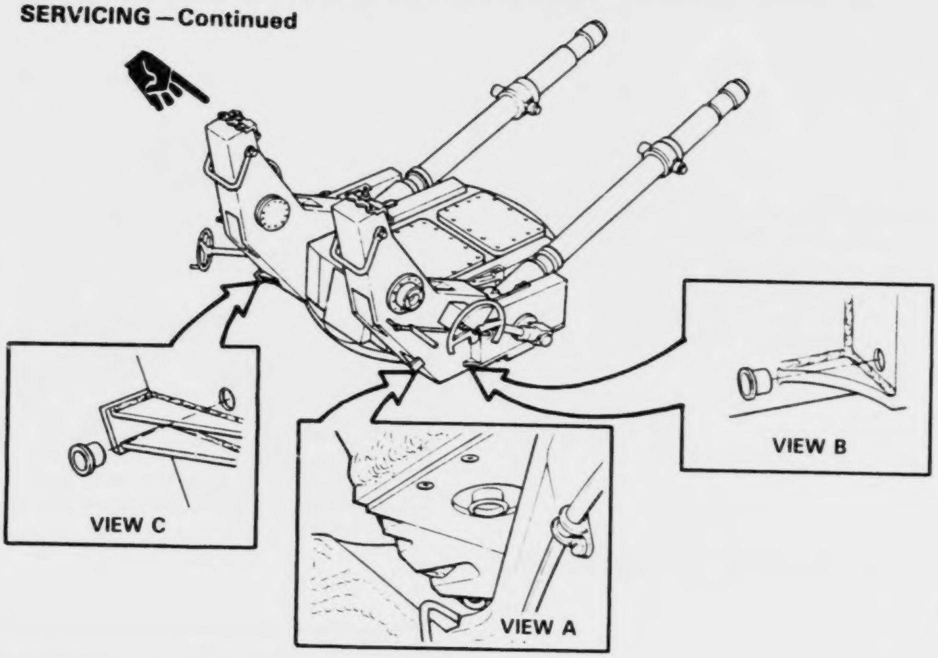
2 Inspect for loose or missing parts. If parts are loose or missing, notify organizational maintenance.

SERVICING

1 Clean top carriage locking pin receivers with rag (item 13, app D). Lube top carriage monthly as required with WTR grease (item 9, app D).

TOP CARRIAGE MAINTENANCE—Continued

SERVICING—Continued



2 Remove drain plugs and drain any accumulation of water.

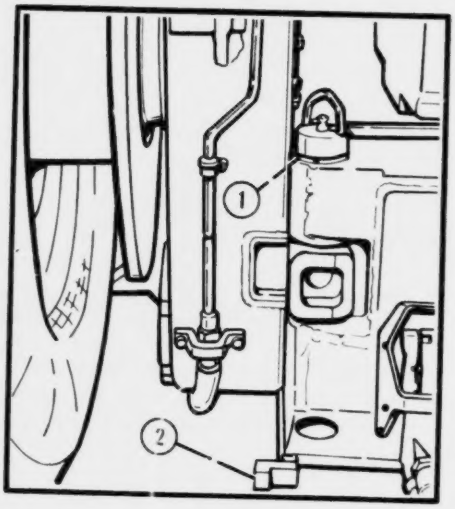
BOTTOM CARRIAGE MAINTENANCE

INSPECTION

1 Inspect wheel lock handle receivers (1) for dirt, burrs, and scoring.

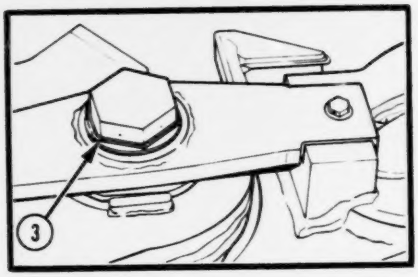
2 Inspect upper and lower arm assembly stops (2) for dirt, ice, and burrs.

3 Check all areas of bottom carriage for foreign material and moisture.

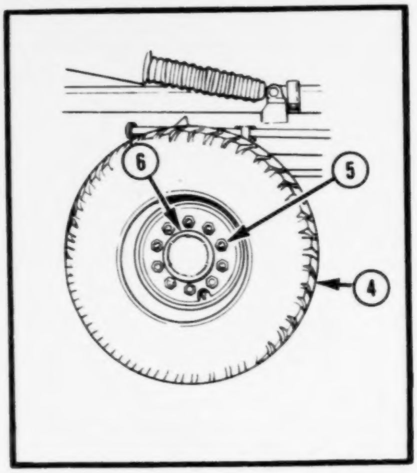


BOTTOM CARRIAGE MAINTENANCE—Continued

4 Check hinge pins (3) for looseness and broken or missing lock wire.

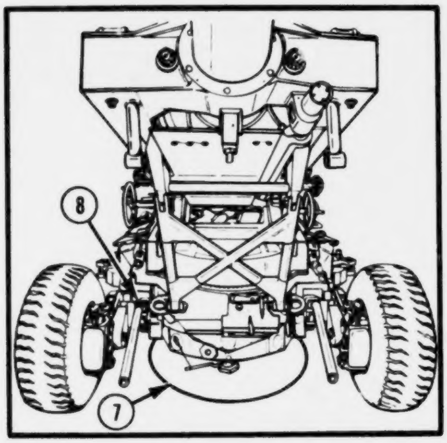


5 Check tires for cuts, stones, nails, and proper inflation: 45 psi (3.16 kg/cm^2) for wide, 100-105 psi (7-7.35 kg/cm^2) for narrow, and 110 psi (7.73 kg/cm^2) for radial. Never reinflate a tire that has been run flat without first having wheel and tire disassembled and checked for defects by the battery motor pool. Check for uneven tread wear. Check wheel nuts (5) to make sure that they are tight.



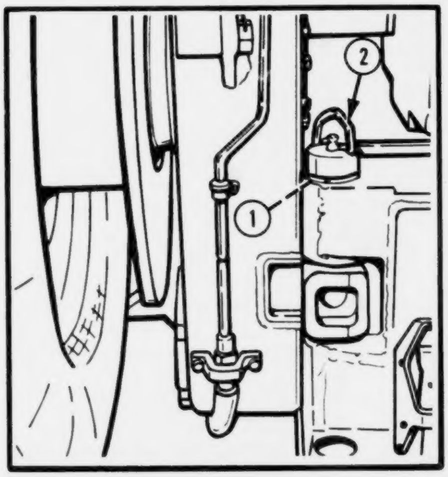
6 Inspect bearing cover plate (6) for loose or missing bolts and missing or broken lock wire. If bolts are loose or missing or lock wire is broken or missing, notify organizational maintenance.

BOTTOM CARRIAGE MAINTENANCE—Continued



7 Inspect firing baseplate (7) and attaching hardware for completeness.

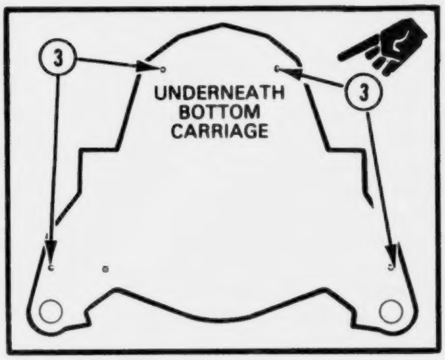
8 Weekly operate hydraulic pumps (8), and lower weapon onto firing baseplate to check for proper operation of wheel lowering and raising.



SERVICING

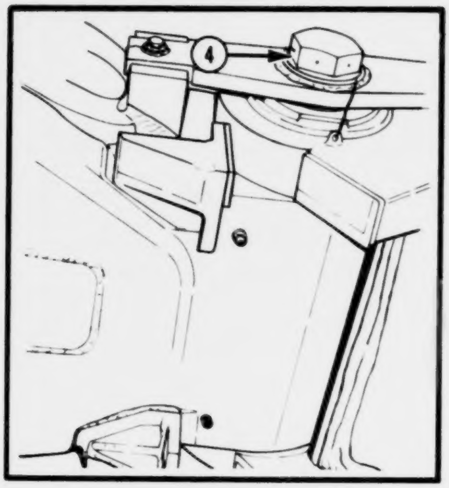
1 Clean wheel lock handle receivers (1) with rag (item 13, app D).

2 Monthly lube wheel lock handles (2) sparingly with WTR grease (item 9, app D).

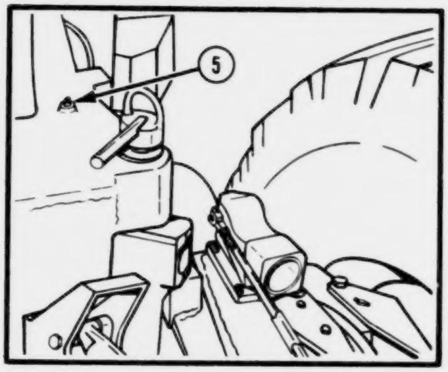


3 Remove drain plugs (3) and drain any moisture.

BOTTOM CARRIAGE MAINTENANCE—Continued



4 Monthly lube hinge pins (4) with WTR grease (item 9, app D).



5 Weekly lube both sides of axles at fittings (5) with WTR grease (item 9, app D) with wheels in travel (down) and firing (up) positions.

WHEEL AND TIRES FOR EMERGENCY USE

Truck, chassis	M40
Truck, chassis	M61
Truck, cargo	M54
Truck, cargo	M813
Truck, dump	M51
Truck, tractor	M52
Truck, medium, wrecker	M62
Truck, chassis	M139, M139C
Truck, cargo	M41
Howitzer, towed, 155-mm	M114, M114A1
Truck, series	M923, M939

BOTTOM CARRIAGE MAINTENANCE—Continued

WHEEL AND TIRE REPLACEMENT

WARNING

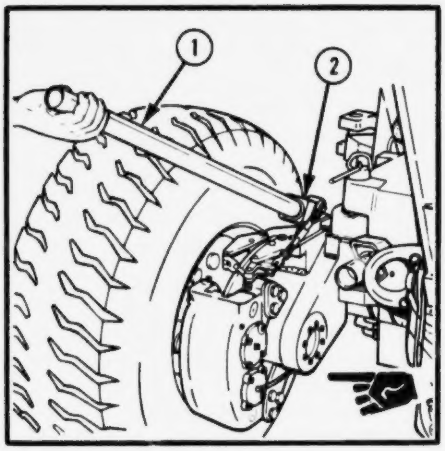
The wheel and tire are heavy. To remove or install, use a hoist if available. If hoist is not available, two crewmen are required to remove or install wheel and tire. Use care to avoid injury.

CAUTION

With replacement wheels and tires, the weapon will weigh 225 pounds (102.06 kg) more and will be 9 inches (22.86 cm) wider. Larger wheels may not fully retract in firing position. Wheel pits will be needed to make sure tires are not resting on ground.

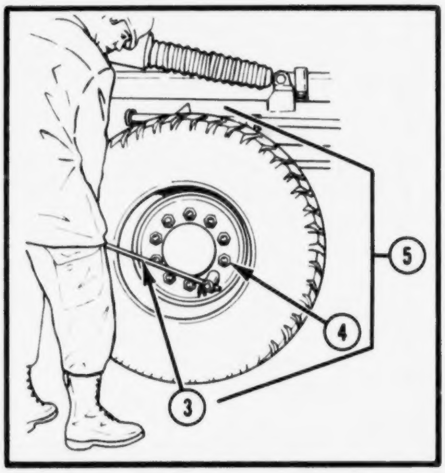
REMOVAL

1 Place howitzer in firing position without spades and engage both handbrakes by inserting pump handles (1) in handbrake sockets (2) and raising up to the locked position.



2 Use prime mover lug nut wrench (3) to remove 10 wheel nuts (4).

3 Remove wheel with tire (5) from howitzer.

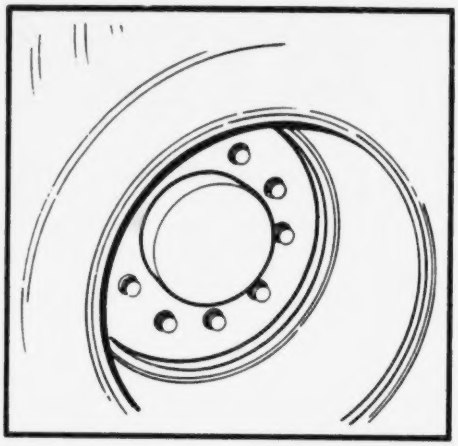


BOTTOM CARRIAGE MAINTENANCE—Continued

WHEEL AND TIRE REPLACEMENT—Continued

INSPECTION

Check bolt holes and chamfers for cracks or defects.



INSTALLATION

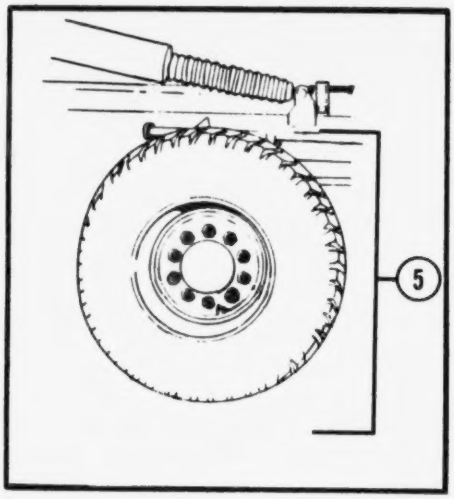
NOTE

When using a prime mover wheel and tire as a spare, install wheel and tire so that tire valve faces in; otherwise wheel and tire will not fit properly.

When using M923 and M939 series tires as spares, the following conditions apply; use wheels in pairs, mount wheels with valve stems pointing inward, inflate tires to recommended pressure. DO NOT tow howitzer at speeds exceeding 30 mph.

Narrow tire and wheel may be used temporarily with wide tire and wheel or bias ply tire and wheel may be used with a radial tire and wheel if all cited inflation pressures for the respective tires are met. Break in new tires at low speeds (5 mph for approximately 3 minutes) then check for proper inflation. If a combination of unmatched tires is used, the maximum towing speed is 30 mph. Replacement of the unmatched tire is to be accomplished at the first opportunity.

The new radial tires have two different tread designs. It is acceptable to mix these tires; however, standard practice is to use matched treads whenever possible.

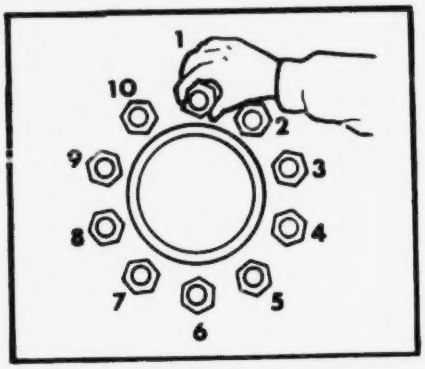


1 Make sure handbrakes are engaged. Install wheel with tire (5) on howitzer.

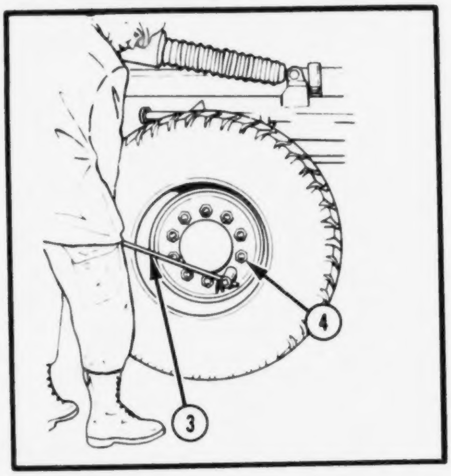
BOTTOM CARRIAGE MAINTENANCE—Continued

WHEEL AND TIRE REPLACEMENT—Continued

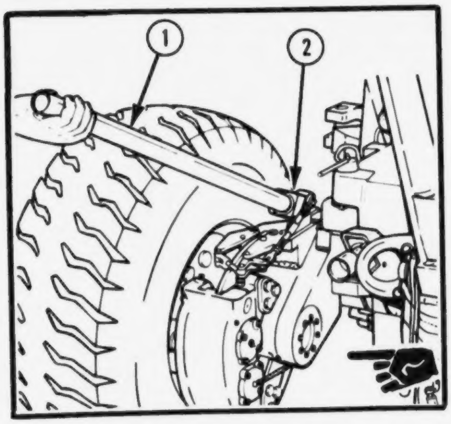
INSTALLATION—Continued



2 Install wheel nuts 1 and 6 finger tight, making sure nuts are properly seated in the wheel. Install remaining wheel nuts finger tight.



2.1 Using lug wrench (3) from prime mover, tighten nuts (4) as tight as possible in a crisscross pattern; i.e., 1 and 6, 2 and 7, 3 and 8, etc., until completed. Notify organizational maintenance as soon as possible to torque wheel nuts.

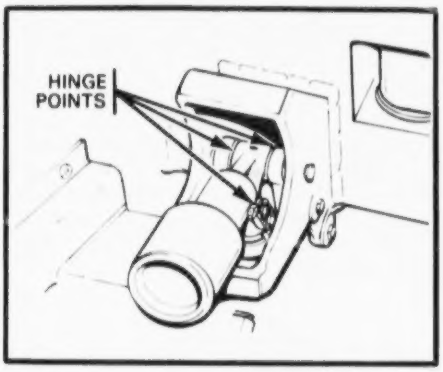


3 Place howitzer in travel position and release handbrakes by inserting pump handles (1) in handbrake sockets (2) and pulling down.

HYDRAULIC PUMPS MAINTENANCE

SERVICING

Apply PL-S (item 11, app D) or CLP (item 1.1, app D) to hinge points.

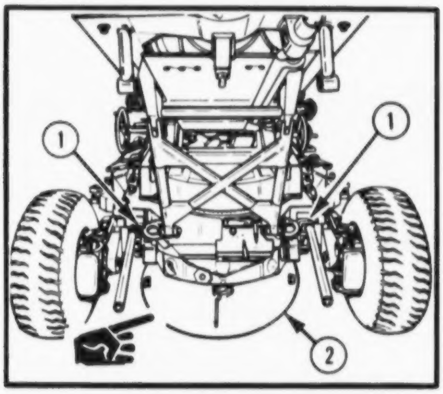


INSPECTION

Inspect for missing or broken parts. If parts are broken or missing, notify organizational maintenance.

TESTING

Weekly test hydraulic pumps (1) by operating them and lowering weapon onto firing baseplate (2).

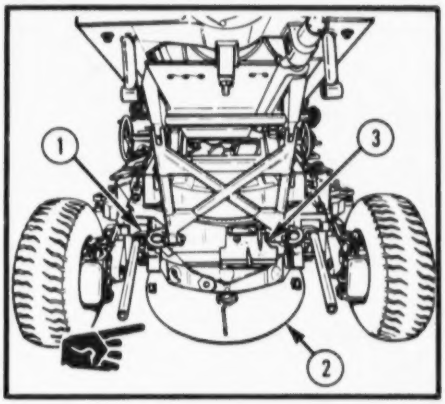


MANIFOLD ASSEMBLY MAINTENANCE

INSPECTION

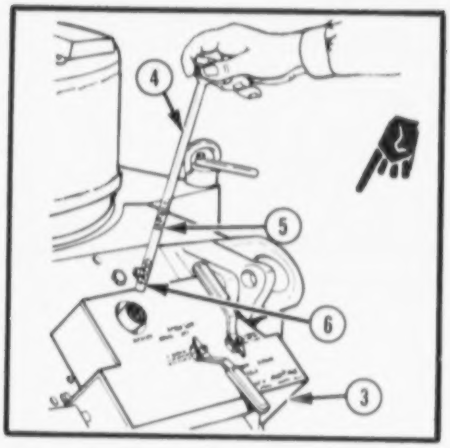
1 Weekly operate hydraulic pumps (1), and lower and raise speed shift assembly to check for proper operation.

2 Weekly operate hydraulic pumps (1) and lower weapon onto firing baseplate (2) to check for proper operation of manifold assembly (3).



MANIFOLD ASSEMBLY MAINTENANCE—Continued

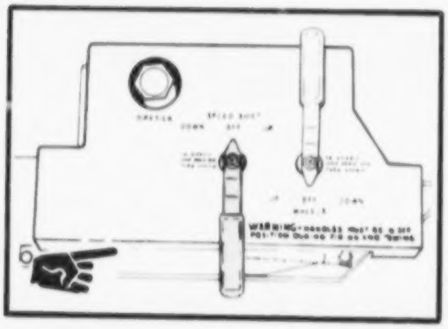
3 Check hydraulic fluid level by unscrewing and removing dipstick (4) from manifold assembly (3). Hydraulic fluid must be present between full mark (5) and add mark (6). If not, fill with OHT (item 9.1, app D) as required.



SELECTOR VALVE (SPEED SHIFT) MAINTENANCE

INSPECTION

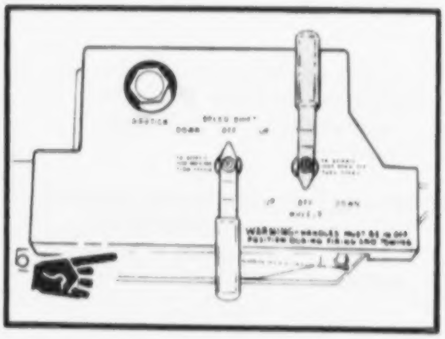
Inspect for loose, missing, or broken parts. If parts are loose, broken, or missing, notify organizational maintenance.



SELECTOR VALVE (WHEELS) MAINTENANCE

INSPECTION

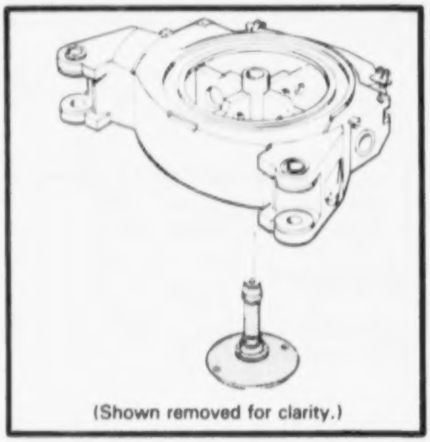
Inspect for loose, missing, or broken parts. If parts are loose, broken, or missing, notify organizational maintenance.



SPEED SHIFT ASSEMBLY MAINTENANCE

INSPECTION

Inspect for loose, broken, or missing parts and evidence of oil leakage. If leaking oil or if parts are loose, broken, or missing, notify organizational maintenance.

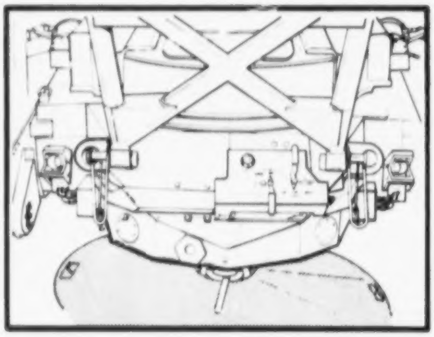


(Shown removed for clarity.)

FIRING BASEPLATE MAINTENANCE

INSPECTION

Inspect for loose dirt, broken or missing parts, and cracks that prevent the locking assembly from engaging. If parts are loose, broken, missing, or locking assembly will not engage, notify organizational maintenance.



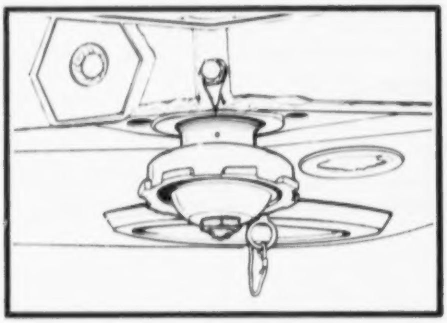
SERVICING

Clean firing baseplate with rag (item 13, app D).

DETENT ASSEMBLY MAINTENANCE

INSPECTION

Weekly check to make sure firing base ball is free from dirt, burrs, and scoring.

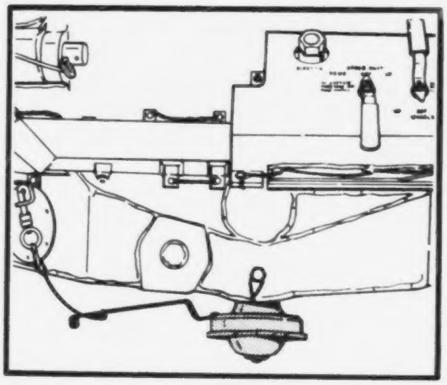


SERVICING

Weekly clean firing base ball with rag (item 13, app D).

LOCKING ASSEMBLY MAINTENANCE

INSPECTION



1 Inspect for missing or damaged parts. If parts are missing or damaged, notify organizational maintenance.

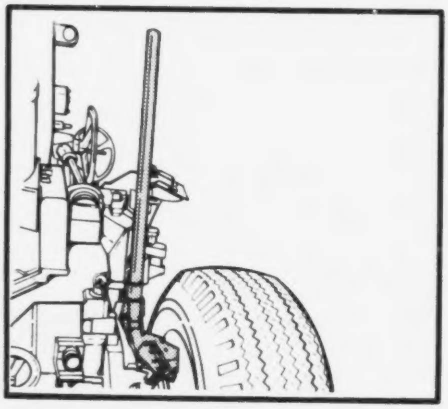
2 Check to ensure locking assembly works properly. If not, notify organizational maintenance.

SERVICING

Weekly clean with rags (item 13, app D) to remove dirt.

HANDBRAKES MAINTENANCE

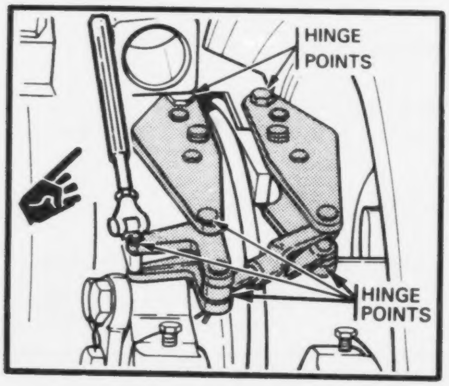
INSPECTION



Inspect for missing hardware. Check operation by raising handle until it locks in upright position. If loose, notify organizational maintenance.

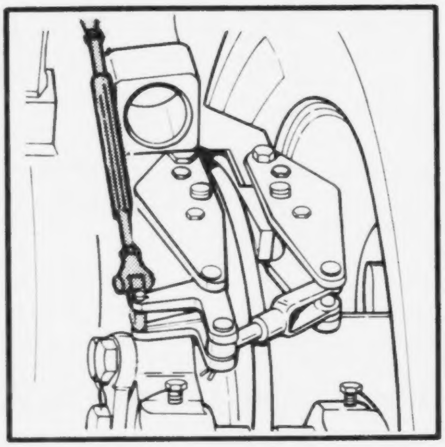
SERVICING

Weekly apply a couple drops of PL-S (item 11, app D) or CLP (item 1.1, app D) on hinge points of both handbrakes.



ROD ASSEMBLY MAINTENANCE

INSPECTION

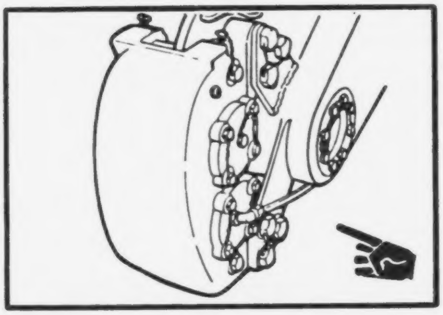


Inspect for loose or missing parts. If parts are loose or missing, notify organizational maintenance.

BRAKE HEAD ASSEMBLY MAINTENANCE

INSPECTION

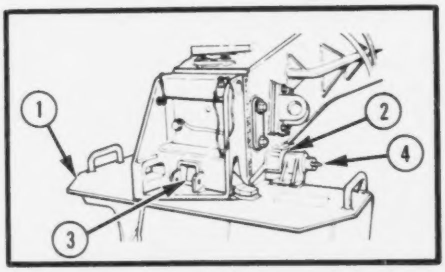
Check to ensure brake fluid is not leaking and hydraulic lines are not cracked or broken. Check for damaged or missing parts. If parts are damaged or missing, notify organizational maintenance.



SPADES MAINTENANCE

INSPECTION

Inspect spades for dirt, nicks, and burrs.



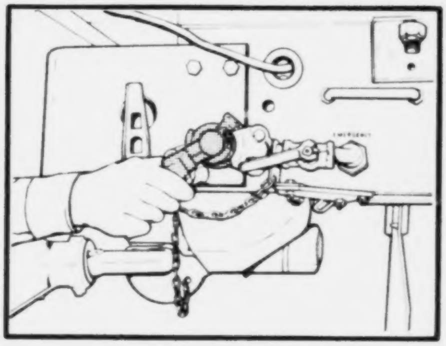
SERVICING

1 Clean spades (1) with wire brush and rag (item 13, app D). Remove dirt from spade sockets (2) and spade key holes (3).

2 Weekly wipe spade hinge pins (4) with PL-S (item 11, app D) or CLP (item 1.1, app D).

EMERGENCY HOSE ASSEMBLY MAINTENANCE

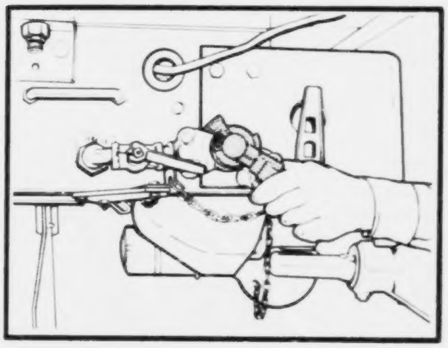
INSPECTION



Check condition of rubber seals in hose couplings. If damaged, notify organizational maintenance.

SERVICE HOSE ASSEMBLY MAINTENANCE

INSPECTION



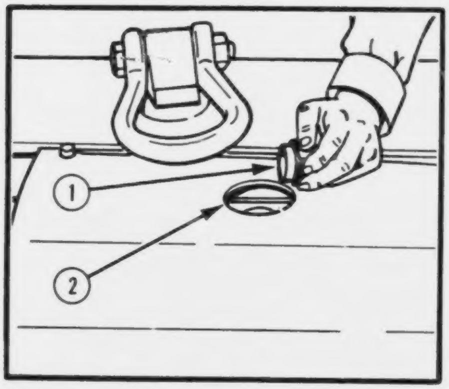
Check condition of rubber seals in hose couplings. If damaged, notify organizational maintenance.

POWER BOOSTER ASSEMBLY MAINTENANCE

INSPECTION

1 Clean dirt from around fluid filler cap (1) with a rag (item 13, app D).

2 Remove fluid filler cap (1) from hydraulic reservoir (2). Brake fluid must be within 3/4 inch (1.90 cm) from top of filling hole.



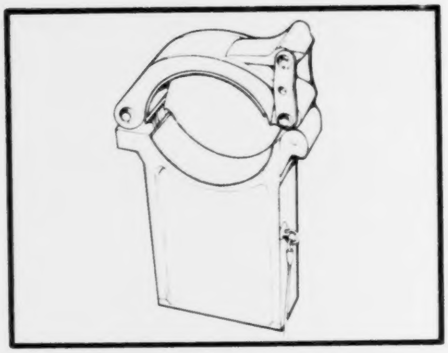
SERVICING

Fill with silicone brake fluid, BFS (item 1.0, app D), as required. Replace cap.

GUN TUBE TRAVEL LOCK MAINTENANCE

INSPECTION

Inspect for loose, missing, or damaged parts. Check mounting surface for nicks and burrs. If parts are loose, damaged, or missing, notify organizational maintenance.



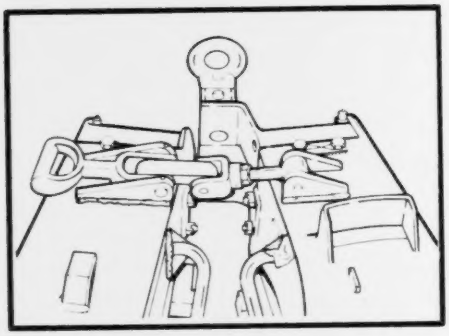
SERVICE

Lube hinge points weekly with PL-S (item 11, app D) or CLP (item 1.1, app D).

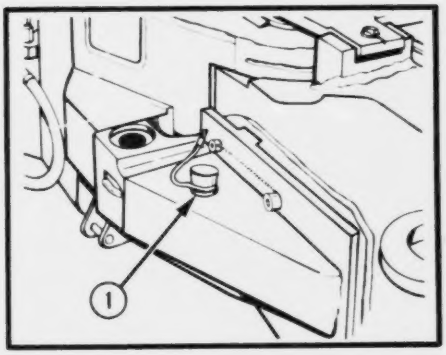
TRAIL (LEFT) MAINTENANCE

INSPECTION

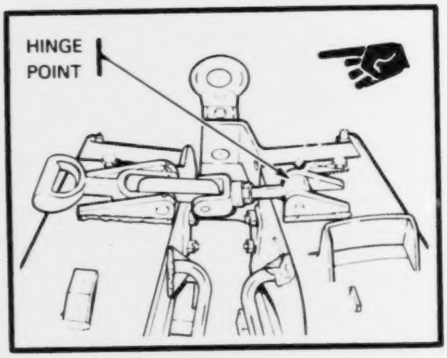
Inspect trail lock for loose, damaged, or missing parts. If parts are loose, damaged, or missing, notify organizational maintenance.



SERVICING



1 **Weekly apply PL-S (item 11, app D) to pin shaft of locking plug (1).**

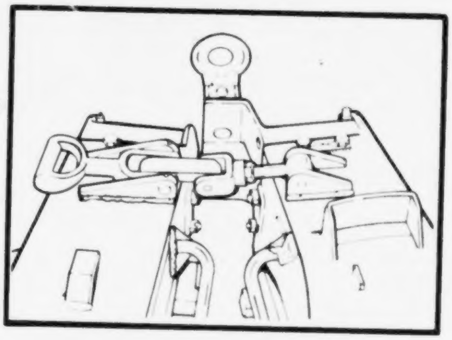


2 Weekly apply a couple drops of PL-S (item 11, app D) or CLP (item 1.1, app D) to hinge point on trail lock (2).

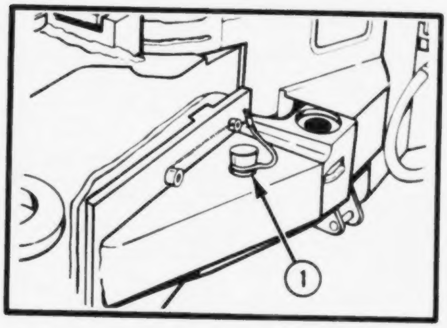
TRAIL (RIGHT) MAINTENANCE

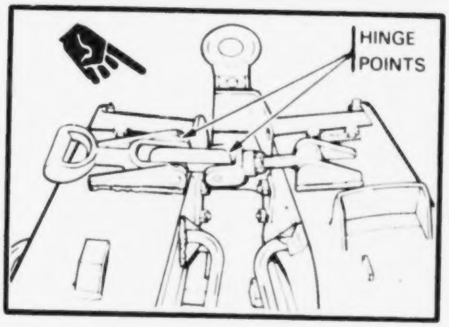
INSPECTION

Inspect trail lock for loose, damaged, or missing parts. If parts are loose, damaged, or missing, notify organizational maintenance.



SERVICING





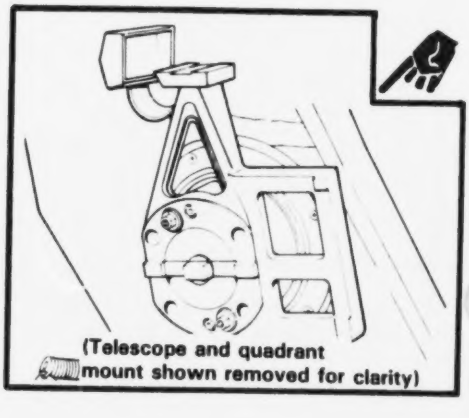
1 **Weekly apply PL-S (item 11, app D) to pin shaft of locking plug (1).**

2 Weekly apply a couple drops of PL-S (item 11, app D) or CLP (item 1.1, app D) to hinge points on trail lock (2). (See arrows.)

ADAPTER ASSEMBLY MAINTENANCE

INSPECTION

Inspect for loose, missing or damaged parts. Check mounting surface for nicks and burrs. If parts are loose, damaged, or missing, notify organizational maintenance.



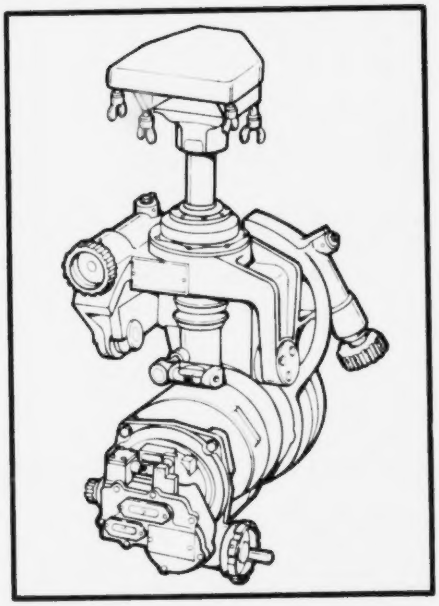
(Telescope and quadrant mount shown removed for clarity)

FIRE CONTROL EQUIPMENT MAINTENANCE

WARNING

☢ When using radioactively illuminated fire control equipment, follow radiation hazard procedures on inside front cover.

M17 FIRE CONTROL QUADRANT MAINTENANCE



INSPECTION

See PMCS, page 2-32.

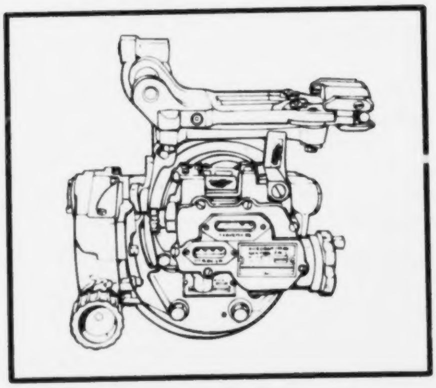
TESTING

See testing M17 and M18 fire control quadrants, page 3-82.

SERVICING

Clean level vials with cheesecloth (item 6, app D) moistened with lens-cleaning compound (item 3, app D).

M18 FIRE CONTROL QUADRANT MAINTENANCE



INSPECTION

See PMCS, page 2-34.

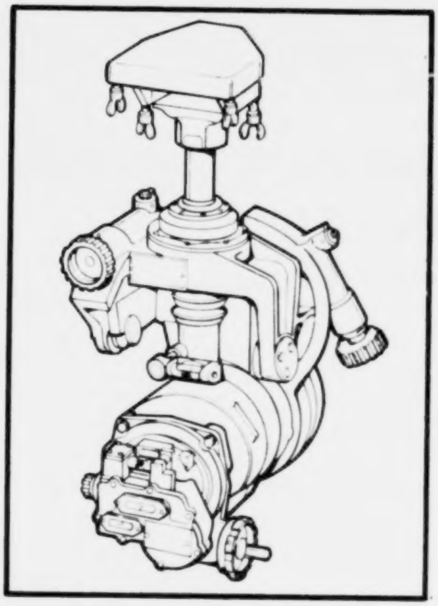
TESTING

See testing M17 and M18 fire control quadrants, page 3-82.

SERVICING

Clean level vials with cheesecloth (item 6, app D) moistened with lens-cleaning compound (item 3, app D).

M171 TELESCOPE AND QUADRANT MOUNT MAINTENANCE



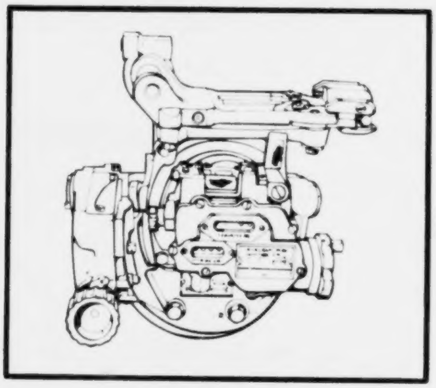
INSPECTION

See PMCS, page 2-32.

SERVICING

Clean with crocus cloth (item 5, app D), and wipe dry.

M172 TELESCOPE AND QUADRANT MOUNT MAINTENANCE



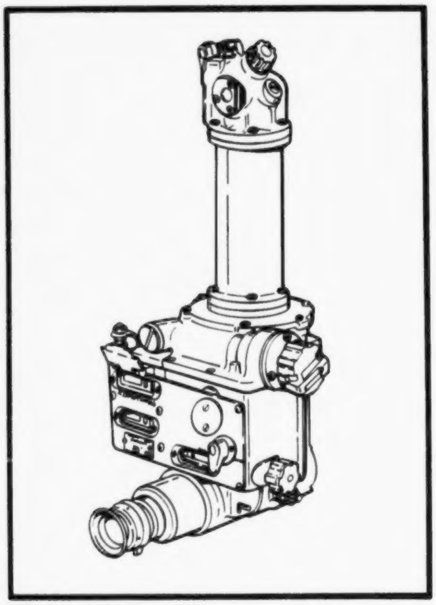
INSPECTION

See PMCS, page 2-34.

SERVICING

Clean with crocus cloth (item 5, app D), and wipe dry.

M137 PANORAMIC TELESCOPE MAINTENANCE



INSPECTION

See PMCS, page 2-36.

TESTING

See reliability test of M137 panoramic telescope on page 3-86 and alinement test of M171 telescope and quadrant mount and M137 pantel, page 3-87.

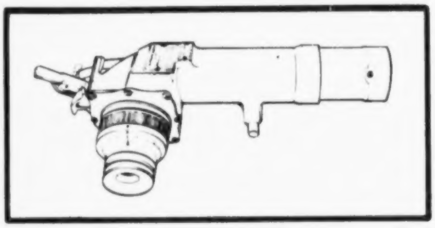
ALINEMENT

See checking boresight alinement of M137 pantel, using M139 alinement device, page 2-77.

INSTALLATION

See page 2-64.

M138 ELBOW TELESCOPE MAINTENANCE



INSPECTION

See PMCS, page 2-38.

ALINEMENT

See boresighting M138 elbow telescope, using distant aiming point on page 2-79.

INSTALLATION

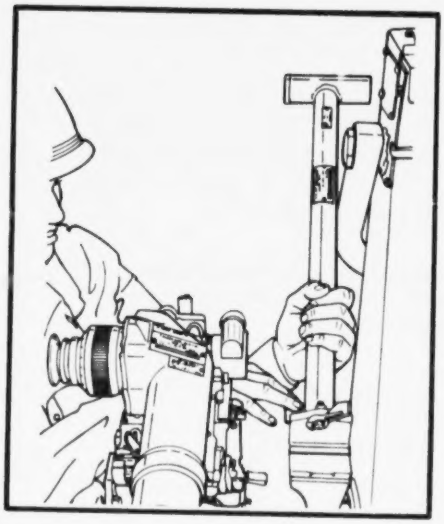
See page 2-67.

Section IV. MAINTENANCE OF AUXILIARY EQUIPMENT

M139 ALINEMENT DEVICE MAINTENANCE

INSPECTION

See PMCS, page 2-39.



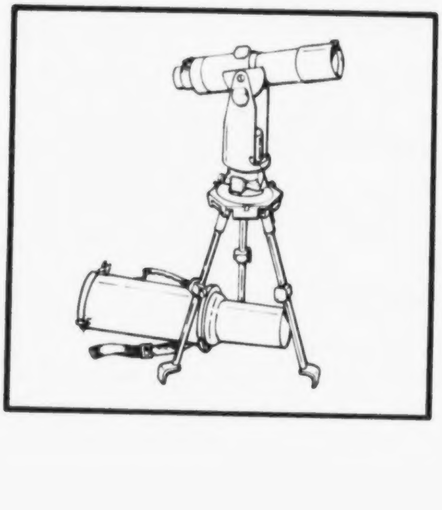
REPLACEMENT

Replace as necessary. (See app B.)

M1A1 COLLIMATOR MAINTENANCE

INSPECTION

See PMCS, page 2-40.



SERVICING

Clean lens with lens paper (item 12, app D) and lens cleaning compound (item 3, app D).

REPLACEMENT

Replace as necessary. (See app B.)

M58 AIMING POST LIGHT MAINTENANCE

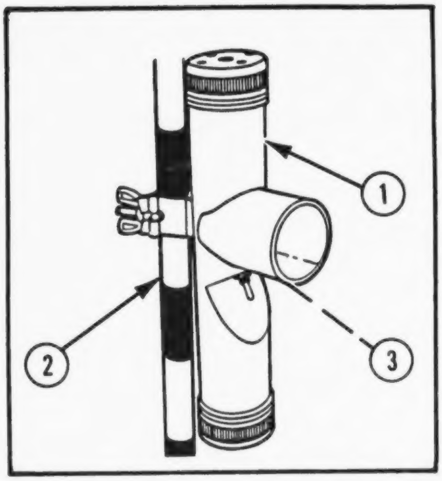
Deleted.

M59 AIMING POST LIGHT MAINTENANCE

Deleted.

M14 AIMING POST LIGHT MAINTENANCE

INSPECTION



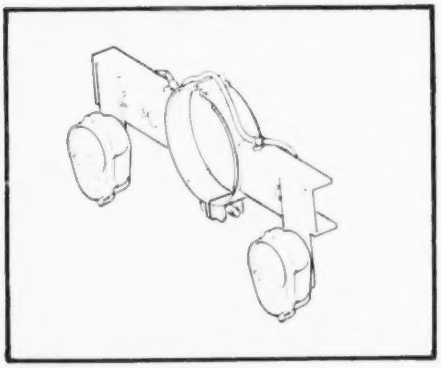
Check light for illumination, and check operation and installation. (Light (1) must be securely clamped to post (2).) Ensure lamp (3) is operational.

REPLACEMENT

Replace as necessary. (See app B.)

Vehicular Taillight

INSPECTION



NOTE
Cable assembly 12009266 must be used with vehicular taillight 12009284.

1. Connect cable assembly (item 5, app B) to prime mover.
2. Ensure all lamps are operational.

Section V. FIRE CONTROL ALINEMENT TESTS AND MEASUREMENTS

3-7. PURPOSE

The fire control alinement tests and measurements are used to determine if the on-carriage fire control, gunner's quadrant, and the alinement device are in correct adjustment. Any equipment that fails these tests must be sent to organizational maintenance.

3-8. FREQUENCY

Recommended intervals for the following tests are:

a. Once each year if weapon is used for nonfiring training.
b. Once every 3 months if weapon is fired.
c. As soon as possible after extensive use.
d. Following accidents.
e. After traveling over extremely rough terrain.
f. When fire control mounts have been replaced.
g. Whenever the weapon fires inaccurately for no apparent reason.
h. After replacement of gun tube.

TEST OF GUNNER'S QUADRANT

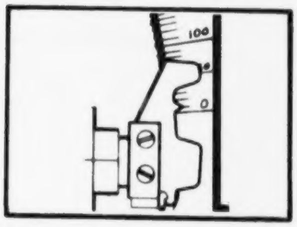
WARNING

When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

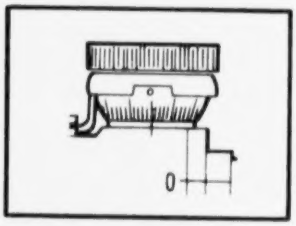
NOTE

Before testing the gunner's quadrant, inspect the quadrant shoes and seats for dirt or defects.

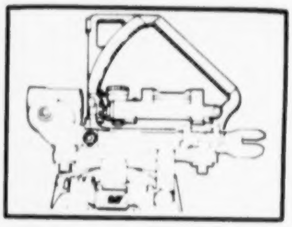
MICROMETER TEST



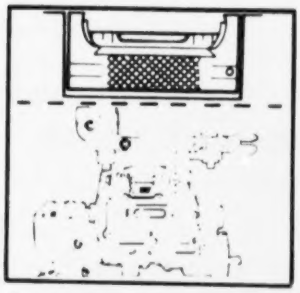
1 Set index at + 10.



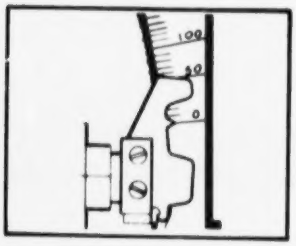
2 Zero the micrometer.



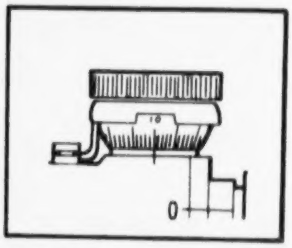
3 Point quadrant to muzzle end.



4 Depress/elevate tube (p 2-2) to center bubble.

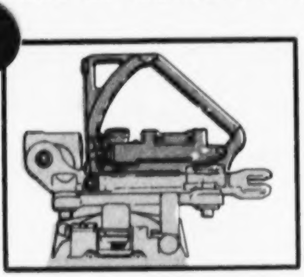


5 Set index at 0.

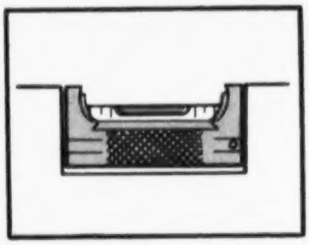


6 Set micrometer at 10.

TEST OF GUNNER'S QUADRANT—Continued



7 Point quadrant to muzzle end.

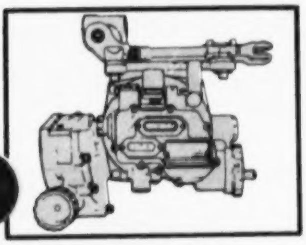


8 Bubble should center.

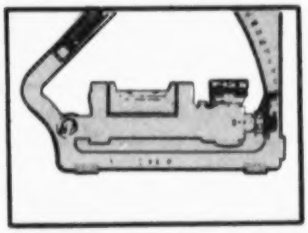
9 If bubble does not recenter, the micrometer is in error. The quadrant should be sent to organizational maintenance.

END-FOR-END TEST

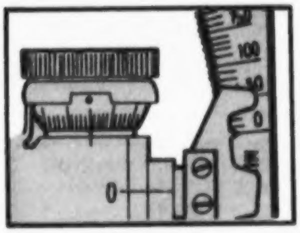
IN TOLERANCE: +0.4, −0.4 **NOT ACCEPTABLE: +0.5, −0.5 or greater**



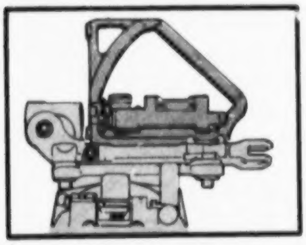
1 Inspect elevation quadrant seats.



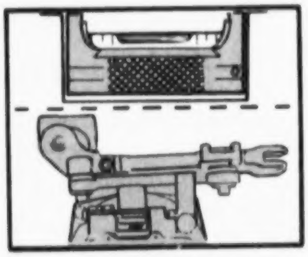
2 Inspect quadrant shoes.



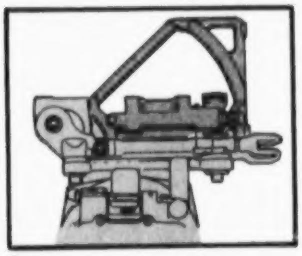
3 Zero the scales.



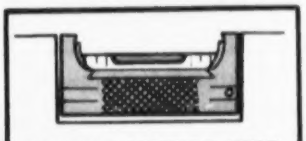
4 Point quadrant toward muzzle end.



5 Depress/elevate tube (p 2-2) to center bubble.

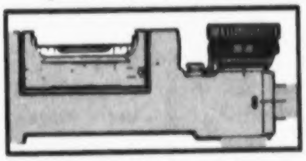


6 Reverse direction.



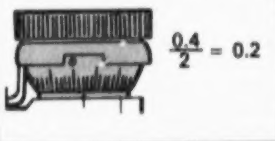
IF BUBBLE CENTERS, TEST IS COMPLETE.

7 Bubble should center. If bubble does not center, go to step 8.



8 Center bubble with micrometer knob. If bubble centers, go to step 9. If it does not, go to step 16.

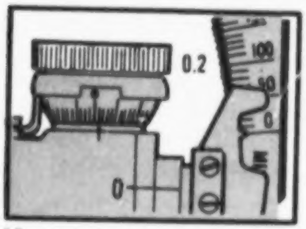
POSITIVE CORRECTION



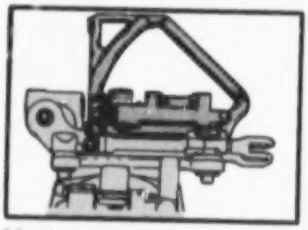
$\frac{0.4}{2} = 0.2$

9 Divide micrometer reading by 2.

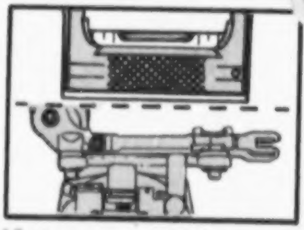
TEST OF GUNNER'S QUADRANT—Continued



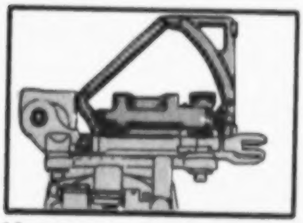
10 Put result on micrometer scale.



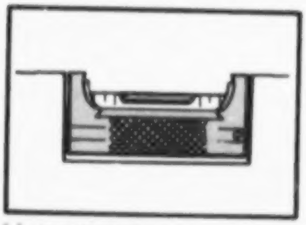
11 Point quadrant toward muzzle end.



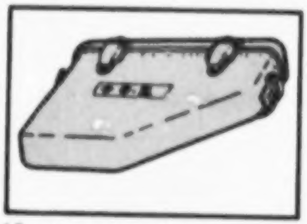
12 Depress/elevate tube (p 2-2) to center bubble.



13 Reverse direction.

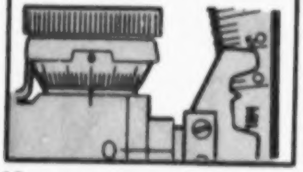


14 Bubble should center.

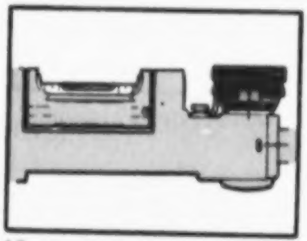


15 Record end-for-end correction.

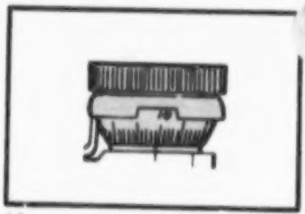
NEGATIVE CORRECTION
(Bubble did not center
at step 8.)



16 Set index at -10.



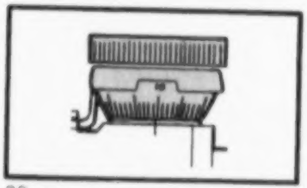
17 Center bubble with micrometer knob.



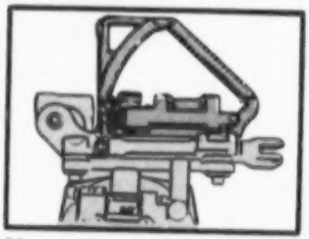
18 Add 10 to micrometer reading.

$$\frac{19.8}{2} = 9.9$$

19 Divide sum by 2.

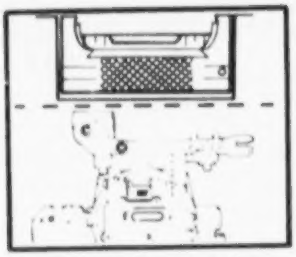


20 Place answer on micrometer scale.

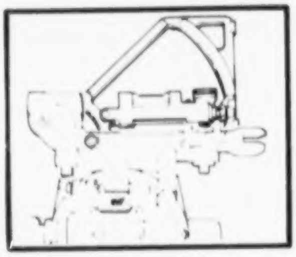


21 Point quadrant toward muzzle end.

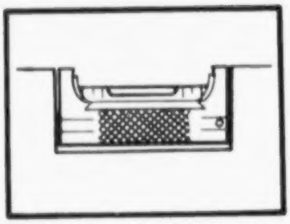
TEST OF GUNNER'S QUADRANT—Continued



22 Depress/elevate tube (p 2-2) to center bubble.



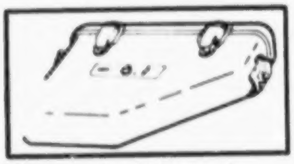
23 Reverse direction.



24 Bubble should center.

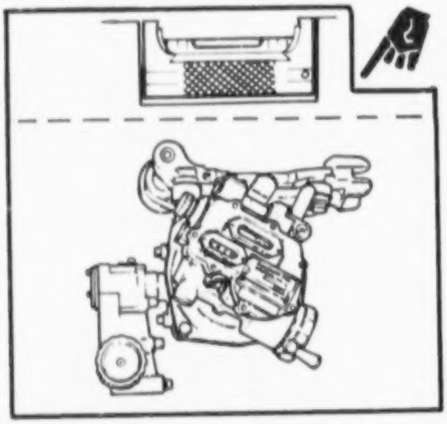
10.0
-9.9
-0.1

25 Subtract micrometer reading from 10.

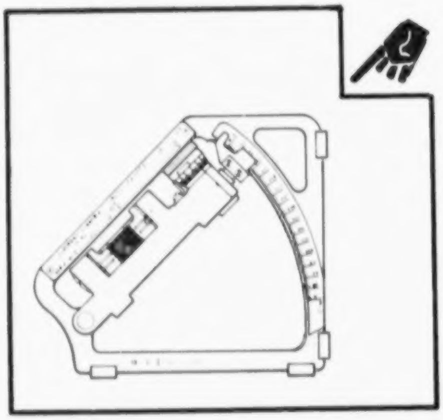


26 Record end-for-end correction.

VERTICAL SHOE TEST High Angle 800 - 1600 mil scale

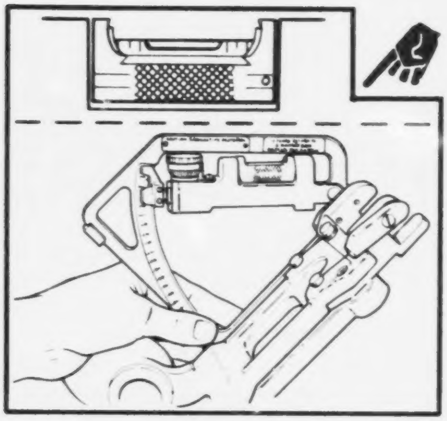


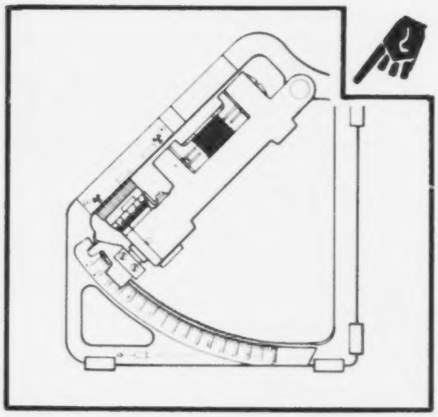
1 Set M18 quadrant to 800 mils, elevate cannon until elevation level bubble is centered, and cross level M18 quadrant as required.



2 Set 800 mils on gunner's quadrant 0-800 mil coarse scale. If there is a correction factor for the horizontal shoes, set corresponding micrometer scale to correction factor; otherwise, set micrometer scale to 0.

TEST OF GUNNER'S QUADRANT–Continued





3 Set gunner's quadrant on M172 mount quadrant seats, with gunner's quadrant LINE OF FIRE arrow toward muzzle. If gunner's quadrant level bubble is not centered, elevate or depress cannon until the bubble is centered.

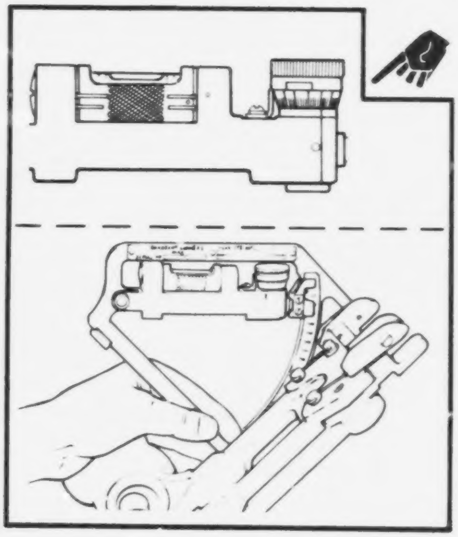
4 Remove gunner's quadrant from M172 mount.

5 Set 800 mils on gunner's quadrant 800-1600 mil coarse scale.

6 Place gunner's quadrant vertical shoes on M172 mount quadrant seats, with gunner's quadrant LINE OF FIRE arrow toward muzzle.

7 Center level bubble on gunner's quadrant with micrometer knob. Gunner's quadrant should read 800 mils ± 0.4 mil.

8 If gunner's quadrant reading deviates more than ± 0.4 mil, the quadrant is defective. Send the gunner's quadrant to organizational maintenance.

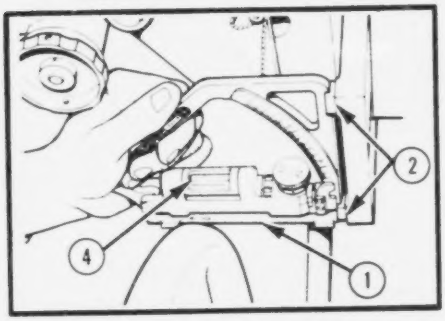


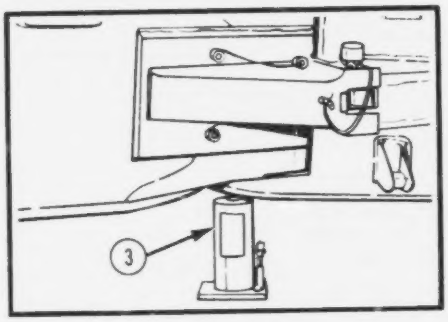
LEVELING TRUNNIONS

WARNING

When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

1 Place the howitzer in firing position on a hard surface, such as concrete or asphalt, if possible; if not, place it on solid ground. Spades must be on, but do not need to be dug in.





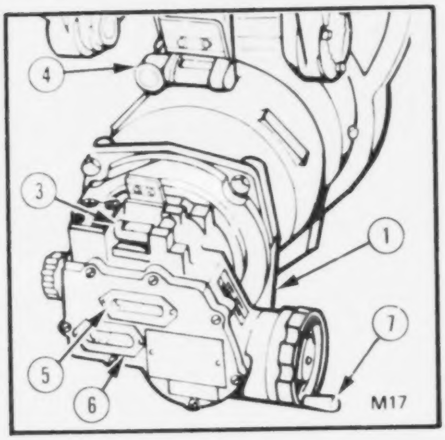
2 Set a pretested gunner's quadrant (1) on the cross level pads (2) with any corrections applied.

3 Using prime mover jack (3), jack up the howitzer on whichever side is necessary to center the gunner's quadrant bubble (4). Trunnions are now level.

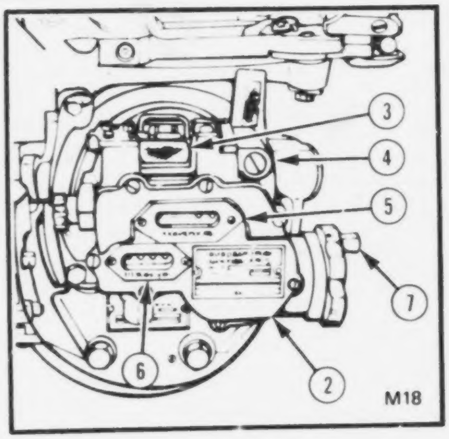
TESTING M17 AND M18 FIRE CONTROL QUADRANTS

WARNING

When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.



M17



M18

1 Before starting, make sure there are no obvious defects on the M17 fire control quadrant (1) or the M18 fire control quadrant (2). Check the M17 and M18 fire

TESTING M17 AND M18 FIRE CONTROL QUADRANTS—Continued

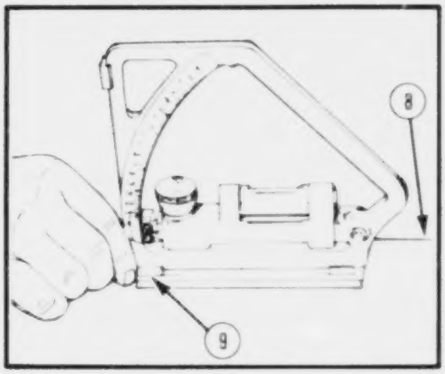
control quadrants for looseness or wobble in their mounting on the trunnions. Also check that the markings on the elevation level vial (3) and cross level vial (4) are legible.

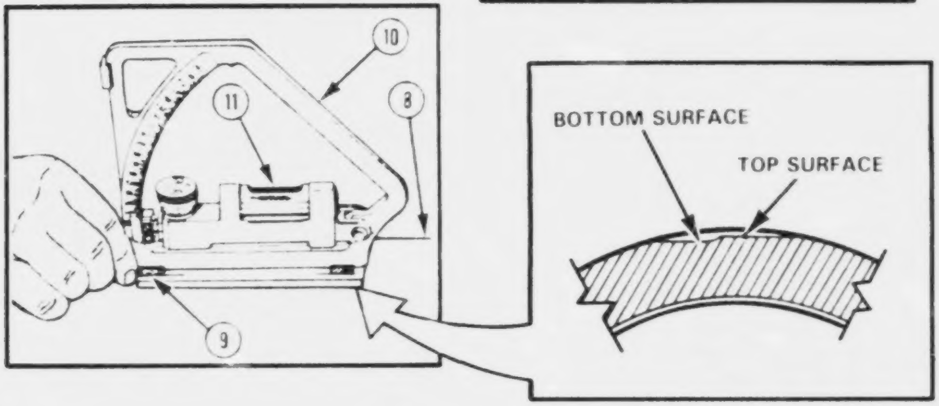
2 Place the howitzer in firing position on a hard surface, such as concrete or asphalt, if possible. Spades must be on, but do not need to be dug in.

3 Set M17 and M18 elevation correction counters (5) to 00, and set elevation counter (6) to 0000. To eliminate backlash, rotate elevation control knob (7) to increase the number from low to high.

4 Depress the cannon tube (8) (p 2-2) to 0 mils, using the M17 fire control quadrant.

5 Ensure cannon leveling pads (9) are clean.





NOTE

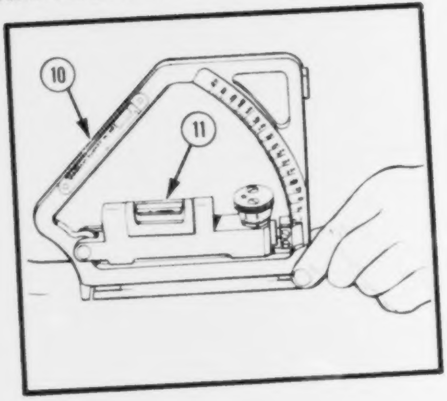
Be sure to place gunner's quadrant on the top surface; use of the bottom surface may lead to erroneous readings.

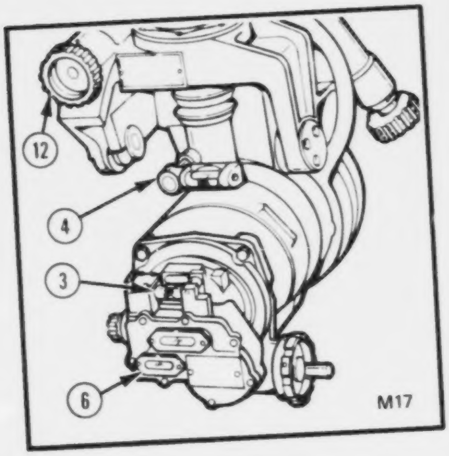
6 Place the pretested gunner's quadrant (10), with corrections applied, on cannon leveling pads (9), alining with edge of top surface as shown, with the LINE OF FIRE arrow pointed toward the muzzle.

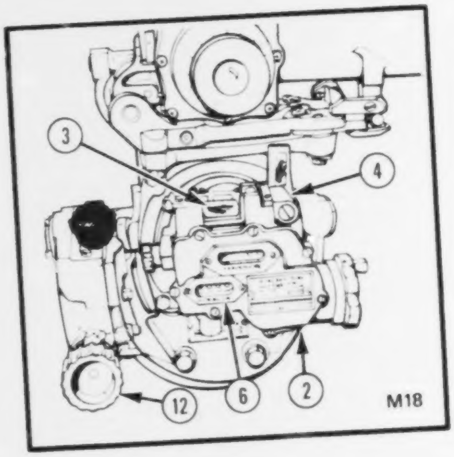
7 Depress or elevate the cannon tube (8) with the elevating handwheel (p 2-2) until the gunner's quadrant bubble (11) centers.

TESTING M17 AND M18 FIRE CONTROL QUADRANTS—Continued

8 Rotate the gunner's quadrant (10) end-for-end. The gunner's quadrant bubble (11) should recenter. If the gunner's quadrant bubble does not recenter, verify the gunner's quadrant correction factor and repeat steps 5 and 6.







NOTE

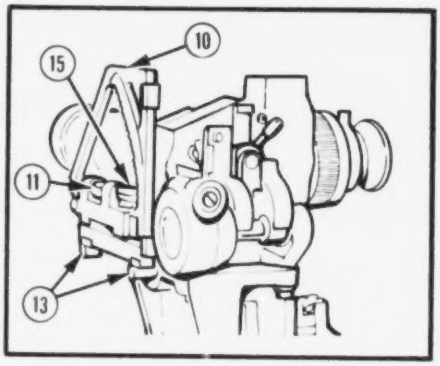
To eliminate backlash during leveling, last motion of pitch/elevation and cross level control knobs will be in a clockwise direction.

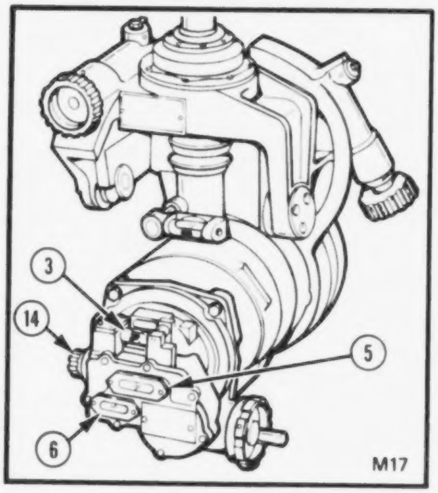
9 Level the M18 fire control quadrant (2) by turning the cross level control knob (12) until the cross level vial (4) centers. With M17 and M18 elevation counters (6) set at 0000, the bubbles in the elevation level vials (3) should be centered. If the bubbles in the elevation level vials are not centered, either the counters or the level vials are out of adjustment; notify organizational maintenance.

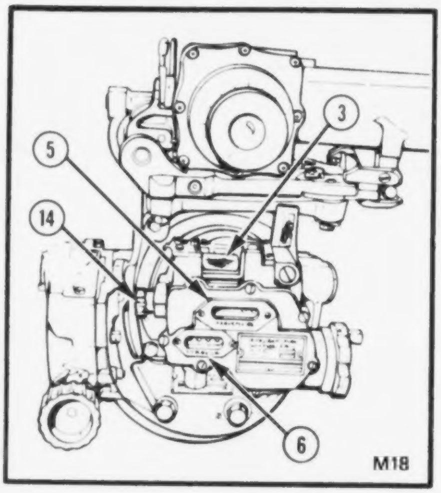
TESTING M17 AND M18 FIRE CONTROL QUADRANTS—Continued

10 With the bubbles in each elevation level vial and cross level vial still centered, place the gunner's quadrant (10) on the quadrant seats (13) with the LINE OF FIRE arrow towards the muzzle.

11 Center the gunner's quadrant bubble (11) and record the reading. The quadrant seats (13) are out of adjustment if the reading changes over 1 mil. Notify organizational maintenance.





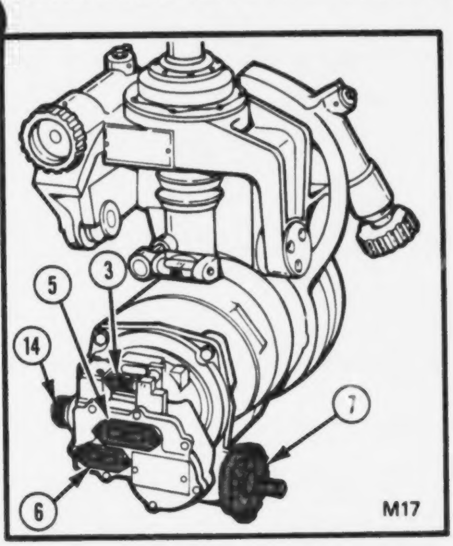


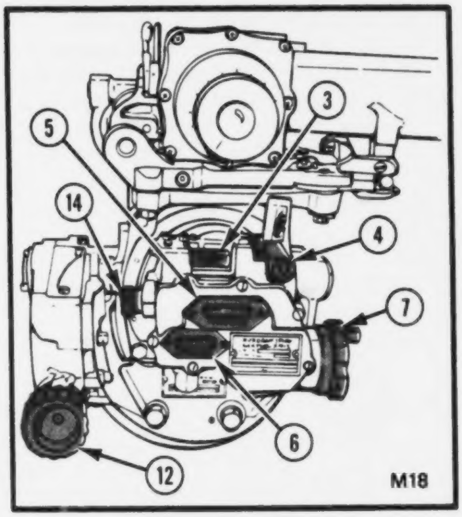
NOTE

Do not forget the gunner's quadrant correction factor when taking these readings.

12 Using the elevation correction knob (14), insert a +5-mil correction in both elevation correction counters (5). The reading in each elevation counter (6) should now read 9995. Set each elevation counter back to zero. Elevate the tube until the bubble in the elevation level vial (3) of the M18 fire control quadrant centers. Center the gunner's quadrant bubble (11). The micrometer (15) should show an increase of 5 mils. When the bubble in the M18 fire control quadrant elevation level vial is centered, the bubble in the M17 fire control quadrant elevation level vial (3) should center ± 1 graduation.

TESTING M17 AND M18 FIRE CONTROL QUADRANTS—Continued





13 Set elevation counter (6) and elevation correction counter (5) on each fire control quadrant back to zero.

4 Insert corrections 10 mils at a time, up to 50 mils, on each elevation correction counter (5) and observe the following:

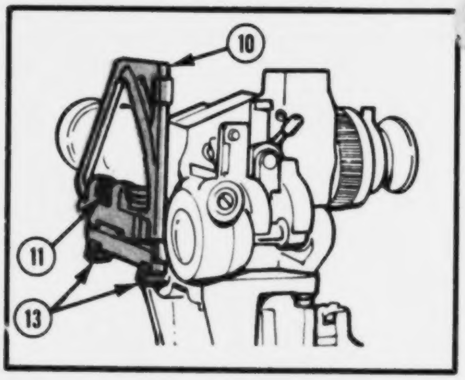
- **a.** The reading in each elevation counter (6) should have decreased by the amount of correction applied within ±0.5 mil.
- **b.** The bubble in the elevation level vial (3) should still be centered. If either the M17 or M18 fire control quadrant does not perform properly, it is defective. Notify organizational maintenance.

15 Return each elevation correction counter (5) to zero using elevation correction knob (14).

16 Set 400 mils on each elevation counter (6), using the elevation control knob (7).

17 Using the elevating handwheel, center the bubble in the elevation level vial (3) on the M18 fire control quadrant. Center the bubble in the cross level vial (4), using the cross level control knob (12). When the bubble in the M18 fire control quadrant elevation level vial is centered, the bubble in the M17 fire control quadrant elevation level vial (3) should center within ±1 graduation.

TESTING M17 AND M18 FIRE CONTROL QUADRANTS—Continued



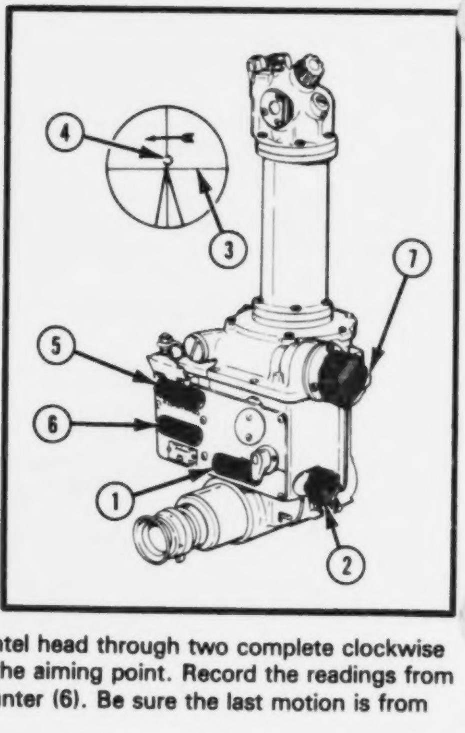
18 Place 400 mils plus or minus any correction factor on the gunner's quadrant (10). Set gunner's quadrant with LINE OF FIRE arrow towards the muzzle on the quadrant seats (13). The gunner's quadrant bubble (11) should center within ±1 mil. If not, the M18 fire control quadrant is defective. Notify organizational maintenance.

19 Repeat steps 15 thru 17 at 900 mils. The M17 and M18 fire control quadrant tests are now completed.

RELIABILITY TEST OF M137 PANORAMIC TELESCOPE

WARNING

☢ **When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.**



1 Level the cannon tube (p 2-2), using the M17 fire control quadrant. Set the M137 pantel correction counter (1) to zero using the gunner's aid knob (2).

2 Level the M171 telescope and quadrant mount (p 2-63).

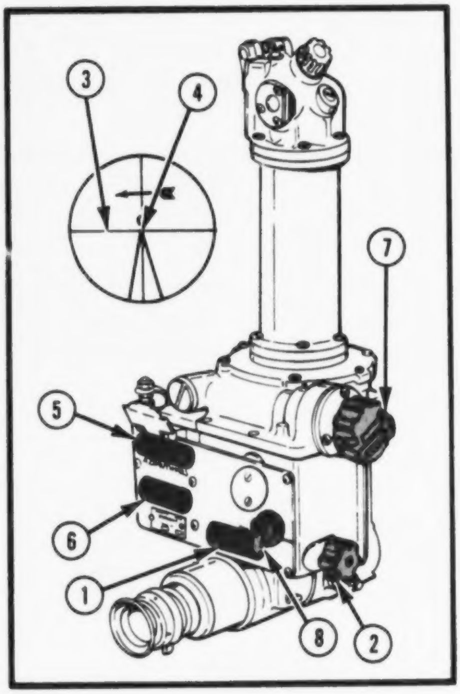
3 Sighting through the pantel, aline the crosshairs (3) on a sharply defined aiming point (4) at least 50 to 100 meters away. (If less than 50 meters distance, use parallax shield.) Be careful not to move the crosshairs. Record the reading from the azimuth counter (5) and deflection counter (6).

NOTE

Eliminate backlash by making the last movement of the pantel head from left to right.

4 Using the azimuth knob (7), rotate the pantel head through two complete clockwise revolutions, and realine the crosshairs on the aiming point. Record the readings from the azimuth counter (5) and deflection counter (6). Be sure the last motion is from left to right.

RELIABILITY TEST OF M137 PANORAMIC TELESCOPE—Continued



Compare the azimuth and deflection counter readings obtained in steps 3 and 4. If the difference between the counter readings is greater than 1 mil, the pantel is defective. Notify organizational maintenance.

6 Repeat steps 4 and 5 by rotating the pantel head counterclockwise. Be sure the last motion is from right to left.

7 Using gunner's aid knob (2), insert corrections 10 mils at a time, up to 50 mils, on the correction counter (1) and observe the following:

- **a.** The crosshairs (3) should not move from the aiming point (4).
- **b.** Reading on azimuth counter (5) should not change.
- **c.** The reading from the deflection counter (6) should change by the amount of correction applied.

8 Repeat step 7, applying corrections in the opposite direction. If the M137 pantel does not perform as stated in step 7, the pantel is defective. Notify organizational maintenance.

9 Disengage the deflection clutch (8). Turn the azimuth knob (7). The deflection counter (6) should not move.

10 Engage the deflection clutch (8).

ALINEMENT TEST OF M171 TELESCOPE AND QUADRANT MOUNT AND M137 PANTEL

WARNING

When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

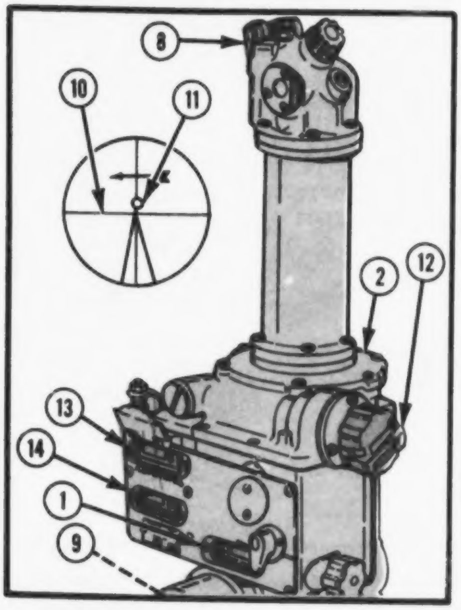
Depress the cannon tube to 0 mils (p 2-2) using the M18 fire control quadrant.

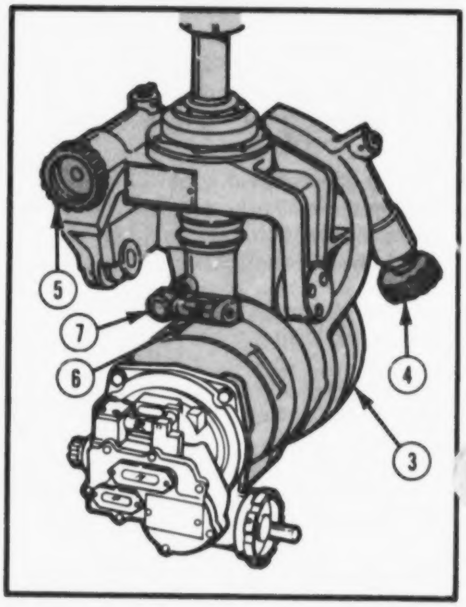
Level trunnions (p 3-81).

ALINEMENT TEST OF M171 TELESCOPE AND QUADRANT MOUNT AND M137 PANTEL— Continued

CAUTION

Do not disturb traverse or move the weapon for any reason when conducting this test.





3 Set the correction counter (1) on the M137 pantel (2) to zero.

4 Carefully level the M171 telescope and quadrant mount (3) by turning the pitch level control knob (4) and cross level control knob (5) until the bubbles in the pitch level vial (6) and cross level vial (7) center.

5 Select a stationary aiming point as far away as possible to the left side of the howitzer so that it will be visible during steps 6, 8, and 11.

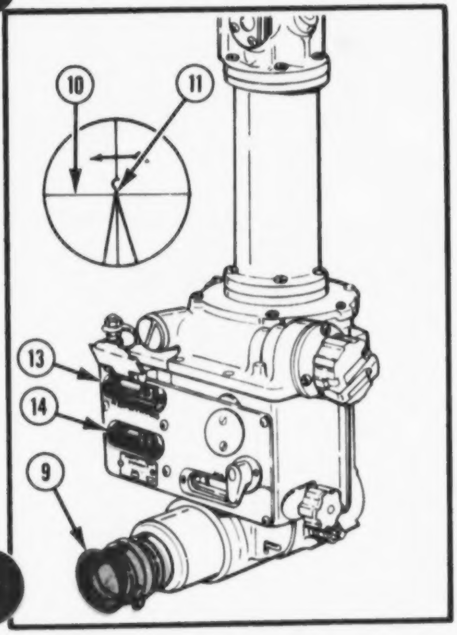
NOTE

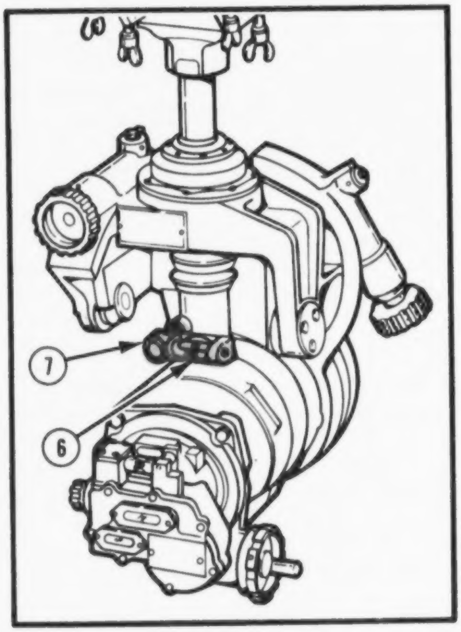
Eliminate backlash by making the last movement of the pantel head from left to right.

6 Close the parallax shield (8) and with bubbles in pitch level vial (6) and cross level vial (7) still centered, sight through the eyepiece (9) and aline the telescope crosshairs (10) on a sharply defined stationary aiming point (11) by turning the azimuth knob (12). Record the readings from the azimuth counter (13) and deflection counter (14).

7 Slowly elevate the cannon tube (p 2-2) to 400 mils, and recenter the bubbles in the pitch level vial (6) and cross level vial (7) on the M171 telescope and quadrant mount (3).

ALINEMENT TEST OF M171 TELESCOPE AND QUADRANT MOUNT ND M137 PANTEL— Continued





8 Sighting through eyepiece (9), realine the crosshairs (10) on the aiming point (11). Record the readings from the azimuth counter (13) and deflection counter (14).

9 Compare the readings from the azimuth counter (13) and deflection counter (14) recorded in steps 7 and 9. If the difference between the readings is greater than 1 mil, the M171 telescope and quadrant mount is defective. Notify organizational maintenance.

10 Slowly elevate the cannon tube (p 2-2) to 900 mils and recenter the bubbles in the pitch level vial (6) and cross level vial (7).

11 Sighting through eyepiece (9), realine the crosshairs (10) on the same aiming point (11). Record the readings of the azimuth counter (13) and deflection counter (14).

12 Compare the readings of the azimuth counter (13) and deflection counter (14) recorded in steps 6 and 11. If the difference between the counter readings is greater than 3 mils at 0 to 900 mils elevation, the M171 telescope and quadrant mount is defective. Notify organizational maintenance.

M139 ALINEMENT DEVICE COMPARISON TEST

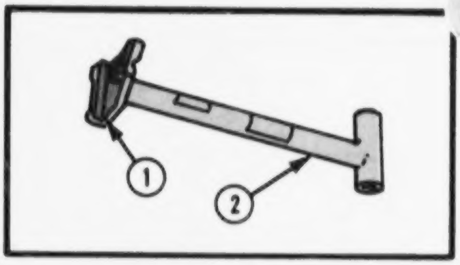
WARNING

When using radioactively illuminated fire control equipment, follow radiation hazard procedures in the front of this manual.

M139 ALINEMENT DEVICE COMPARISON TEST—Continued

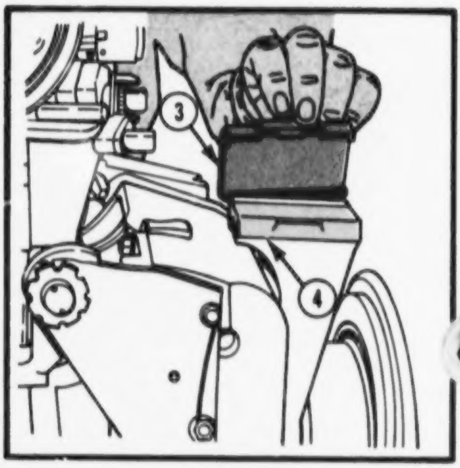
1 Get two M139 alinement devices from other howitzer sections.

2 Inspect mating surfaces (1) of the alinement device (2) for nicks, burrs, and dirt. If dirty, clean with a rag (item 13, app D). Request organizational maintenance to remove any nicks or burrs. If nicks or burrs cannot be removed, perform test to determine if alinement device is defective.



3 Remove protective cover (3) from dovetail (4) and check the surface as you did for the alinement device in step 2. Wipe dovetail clean with a rag (item 13, app D).

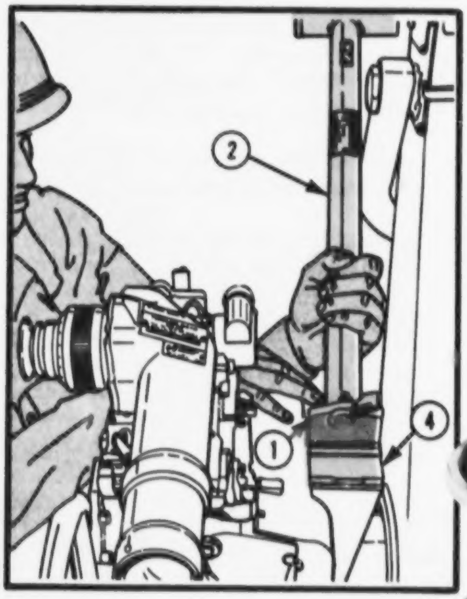
4 Level the cannon tube (p 2-2), using the M18 fire control quadrant.



5 Install the alinement device (2). Make sure the mating surface (1) matches with dovetail (4).

6 Level the M171 telescope and quadrant mount (p 2-63).

CAUTION
After leveling the M171 telescope and quadrant mount, be careful not to disturb the pitch level setting.



M139 ALINEMENT DEVICE COMPARISON TEST—Continued

7 Aline the crosshairs (5) of the M137 pantel with the crosshairs (6) of the alinement device by turning azimuth knob (7). Center the crosshairs for elevation; turn the elevation knob (8).

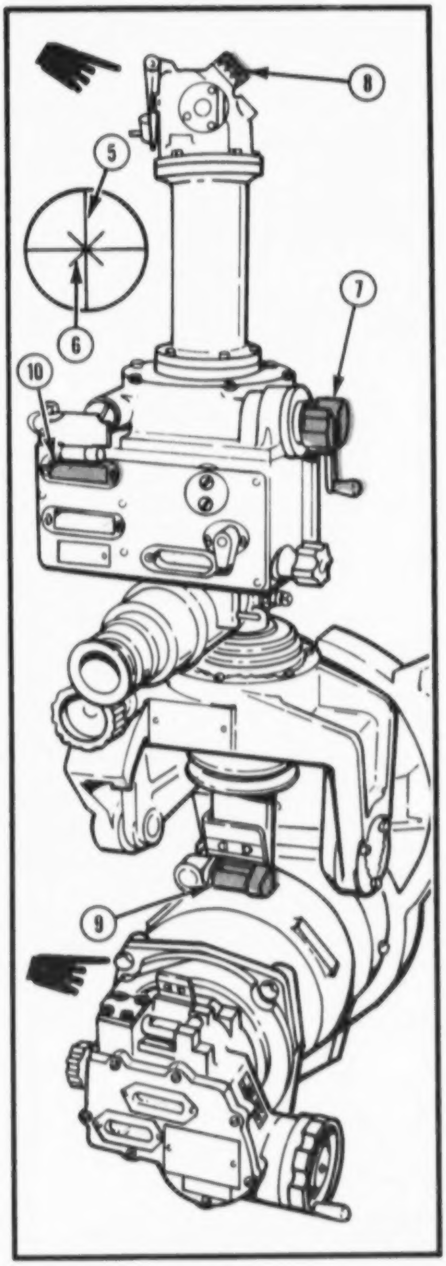
8 With the pantel and alinement device crosshairs alined, the bubble centered in the pitch level vial (9) of the M171 telescope and quadrant mount, and the cannon tube at zero elevation, record the reading of the pantel azimuth counter (10).

9 Remove the alinement device and install a second alinement device. Make sure dovetail and mating surfaces match.

10 Repeat steps 7 and 8 with a second alinement device.

11 Now repeat steps 7 and 8 with a third alinement device. Compare the three azimuth counter readings. If the difference between the readings is less than 1 mil, the alinement devices are serviceable. Any alinement device that exceeds the 1-mil tolerance is defective. Notify organizational maintenance.

12 Remove and store the M139 alinement device.



CHAPTER 4
AMMUNITION

Section I. GENERAL

4-1. GENERAL

a. Ammunition for the M199 cannon is the separate-loading type. The loading of each complete round into the cannon requires three separate operations: loading the fuzed projectile, the propelling charge, and the primer.

b. These components are shipped separately; therefore, the cannon crew must know how to store, unpack, inspect, prepare, and load each complete round every time the weapon is fired.

(1) The chief of section supervises the loading duties normally performed by cannoneers no. 1, 3, 4, and 6 and the preparation duties performed by cannoneers no. 2, 5, and 7.

(2) The chief of section must also see that the cannoneers and driver are cross-trained in the specific duties of the care, handling, unpacking, inspection, preparation, and loading of the ammunition components in order to sustain a 24-hour operation or to operate with a reduced crew.

c. It is planned that future ammo for all new 155-mm weapons will be interchangeable. This will enable projectiles and propelling charges of one NATO nation to be fired from the 155-mm weapons of all others. Current items of interchangeability are contained in chapter 5.

d. For maintenance of ammunition, see TM 9-1300-251-20.

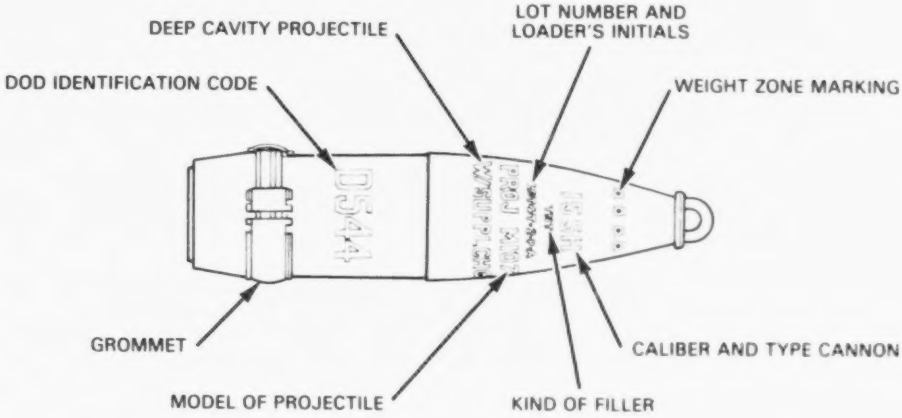
WARNING
Until safety and reliability testing is completed, the use of ammo other than prescribed in this manual is prohibited.

e. Refer to paragraph 4-31 for information about the Loose Projectile Restraint System (LPRS), which is a divider rack for securing loose unfuzed projectiles for transportation in a field artillery companion vehicle.

4-2. IDENTIFICATION

Important information is stenciled on each projectile. New and old projectile colorings and markings are listed in table 4-1 (p 4-3). Knowing the color coding and the meaning of the markings will aid in the rapid selection of the required projectile when firing. Know your ammunition!

MARKING OF THE 155-MM HE PROJECTILE


DEEP CAVITY PROJECTILE
LOT NUMBER AND LOADER'S INITIALS
DOD IDENTIFICATION CODE
WEIGHT ZONE MARKING
D544
GROMMET
CALIBER AND TYPE CANNON
MODEL OF PROJECTILE
KIND OF FILLER

PROJECTILE, 155-MM, HERA, M549

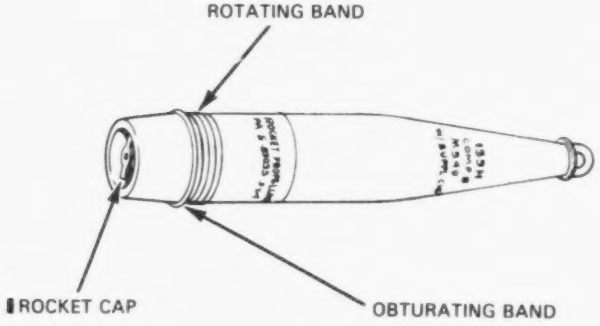

ROTATING BAND
ROCKET CAP
OBTURATING BAND

Table 4-1. Model Numbers and Color Coding of Projectiles

Model number and type of projectile	New manufacture			Old manufacture		
	Color of projectile	No./color of bands	Marking	Color of projectile	No./color of bands	Marking
M107, HE, comp B and TNT filler w/and w/o suppl charge	Olive drab	None	Yellow	Olive drab	None	Yellow
M110, agent (H, HD), w/burster	Gray	2/Green 1/Yellow *****	Green	Gray	2/Green	Green
M110(M110E1), M110A1 (M110E2), M110A2 (M110E3), smoke (WP)	Light green	1/Yellow	Red	Gray	1/Yellow	Yellow
M116, M116B1, smoke BE (HC)	**Light green**	**None**	**Black**	Gray	1/Yellow	Yellow
M116A1, smoke BE (HC)	Light green	None	Black	Not applicable		
M121A1, agent (GB or VX), w/burster	Gray	3/Green 1/Yellow *****	Green	Gray	GB 1/Green VX 2/Green	Green
M687, agent (GB2) w/burster	Gray	1/Broken Green 1/Yellow	Dark Green	**Not applicable**		
M449 series, HE, ICM	Olive drab	Diamonds*	Yellow	Olive drab	None	Yellow
M483A1, HE, ICM	Olive drab	Diamonds*	Yellow	Not applicable		
M864, HE, ICM, extended range	**Olive drab**	**Diamonds***	**Yellow**	**Not applicable**		
M485A1, M485A2, illuminating	Olive drab	1/White	White	**Olive drab**	**None**	**White**

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*Row of yellow diamonds between nose and bourrelet of projectile.

*****Renovated or newly manufactured (post 1976) projectiles will be marked with one green band and, if burstered, one yellow band.

Table 4-1. Model Numbers and Color Coding of Projectiles—Continued

Model number and type of projectile	New manufacture			Old manufacture		
	Color of projectile	No./color of bands	Marking	Color of projectile	No./color of bands	Marking
M549, M549A1, HERA	Olive drab	None	Yellow	Not applicable		
M692, HE (ADAM**)	Olive drab	Triangles***	(L) Yellow	Not applicable		
M731, HE (ADAM**)	Olive drab	Triangles***	(S) Yellow	Not applicable		
M718/ M718A1, AT (RAAMS****)	Olive drab	Triangles***	(L) Yellow	Not applicable		
M741/ M741A1, AT (RAAMS****)	Olive drab	Triangles***	(S) Yellow	Not applicable		
M712, HEAT (Copperhead)	Black (except window area of cone)	None	Yellow	Not applicable		
M823, training (Copperhead)	Bronze	None	Black	Not applicable		
M804, practice	Blue	1/Brown	White	Not applicable		
M825, smoke (WP)	Light green	1/Yellow	Red	Not applicable		

**ADAM—Area denial artillery munition.

***Yellow triangles between the nose and bourrelet of projectile with letters S or L painted inside the triangle.

****RAAMS—Remote anti-armor mine system.

4-3. AUTHORIZED PROJECTILES

WARNING

Unauthorized assembly and use of projectiles and propelling charges are extremely dangerous. Make sure projectiles are marked 155H (not G).

a. Projectile and fuze combinations for authorized rounds are given in table 4-2 (p 4-5).

Table 4-2. Authorized Projectile and Fuze Combinations

Projectile	Fuze									
	Impact		MT	MTSQ				Proximity		
	M739 series	M572 and M557	M565	M501 series	M564	M577 series	M582 series	M728	M732	M514 series
M107, HE	X	X			X		X	X	X	X
M110, agent (H, HD)	X	X			X		X			
M110 (M110E1), M110A1 (M110E2), M110A2 (M110E3), smoke, WP	X	X			X		X			
M116, M116B1, smoke, BE (HC)				X						
M116A1, smoke, BE (HC)			X			X				
M121A1, agent (GB or VX)	X	X						X	X	
M687, agent (GB2)	X	X								
M449, M449A1, HE, ICM			X			X				
M483A1, HE, ICM						X				
M864, HE, ICM, extended range						X				
M485A1, M485A2, illuminating			X			X				
M549, M549A1, HERA	X	X					X			
M692, HE (ADAM)						X				
M731, HE (ADAM)						X				

WARNING

The M728 proximity fuze shall not be used with the M203 series propelling charge. Premature malfunction could result.

NOTE

M483A1 and M864 projectiles may be used for self-registration (as a spotting round) by replacing the expulsion charge assembly with a projectile spotting charge added to the M577 series fuze.

The M728 and M732 proximity fuzes are to be fired with the M121A1 VX projectile in combat emergency only.

M514 series firing limits are 0°F to 120°F (−18°C to +49°C) (for USMC training only).

Table 4-2. Authorized Projectile and Fuze Combinations – Continued

Projectile	Fuze									
	Impact		MT	MTSQ				Proximity		
	M739 series	M572 and M557	M565	M501 series	M564	M577 series	M582 series	M728	M732	M514 series
M718/M718A1, AT, (RAAMS)						X				
M741/M741A1, AT, (RAAMS)						X				
M804, practice	X	X			X		X		X	
M825, smoke (WP)						X				

WARNING

Only those items listed are authorized. Firing of unauthorized propelling charge, projectile, or fuze combinations can result in critical malfunctions. Charge 1 (M3 series green bag) will not be fired in the M199 cannon. Charge 2 (green bag charge (GB)) may be used with any M100 series projectile, M449, M804 and the M485 projectile; however, stickers may occasionally be encountered. All other projectiles use minimum charge 3 (GB) or charge 3 (white bag charge (WB)) and above. Firing below these charges may result in stickers.

b. Authorized projectile and propelling charge combinations are given in table 4-3 below.

Table 4-3. Authorized Projectile and Propelling Charge Combinations

Projectiles	Propelling charge													Firing warnings
	(GB) M3 and M3A1					(WB) M4A1 and M4A2					M119	M119A1 and M119A2	M203 and M203A1	
	Charge 1	2	3	4	5	Charge 3	4	5	6	7	Charge 8	Charge 7, 8***	Charge 8	
M107, HE	**	X	X	X	X	X	X	X	X	X	X	X	No	

**Charge 1 must not be fired in the M199 cannon because of stickers. Firing at Charge 2 may result in stickers occasionally.

***M119A2 charge 7 is equivalent to M119/M119A1 charge 8. Refer to firing tables for small differences in velocity which affect range.

NOTE

PRIMER M82 is the only authorized primer to be used in the M199 cannon.

M203 series charge 8 is not equivalent to M119/M119A1 charge 8.

Table 4-3. Authorized Projectile and Propelling Charge Combinations—Continued

	Propelling charge													
	(GB) M3 and M3A1					(WB) M4A1 and M4A2					M119	M119A1 and M119A2	M203 and M203A1	
Projectiles	Charge 1	2	3	4	5	Charge 3	4	5	6	7	Charge 8	Charge 7, 8***	Charge 8	Firing warnings
M110 agent (H, HD)	**	X	X	X	X	X	X	X	X	X	X	X	No	M110 agent burster loaded with tetrytol cannot be stored/fired at temperatures exceeding +125°F (+52°C).
M110 (M110E1), M110A1 (M110E2), M110A2 (M110E3), smoke (WP)	**	X	X	X	X	X	X	X	X	X	X	X	No	M110 (M110E1) burster loaded with tetrytol cannot be stored/fired at temperatures exceeding +125°F (+52°C). Do not fire WP projectiles known to have been stored other than base down. Firing of such projectiles could contribute to inbore explosions or close-in premature malfunctions.

**Charge 1 must not be fired in the M199 cannon because of stickers. Firing at Charge 2 may result in stickers occasionally.

***M119A2 charge 7 is equivalent to M119/M119A1 charge 8. Refer to firing tables for small differences in velocity which affect range.

NOTE

PRIMER M82 is the only authorized primer to be used in the M199 cannon.

M203 series charge 8 is not equivalent to M119/M119A1 charge 8.

Table 4-3. Authorized Projectile and Propelling Charge Combinations—Continued

	Propelling charge													
	(GB) M3 and M3A1					(WB) M4A1 and M4A2					M119	M119A1 and M119A2	M203 and M203A1	
Projectiles	Charge 1	2	3	4	5	Charge 3	4	5	6	7	Charge 8	Charge 7, 8***	Charge 8	Firing warnings
M116, M116B1, smoke, BE (HC)	**	X	X	X	X	X	X	X	X	No	No	No	No	
M116A1, smoke, BE, HC	**	X	X	X	X	X	X	X	X	X	X	X	No	
M121A1 agent (GB or VX)	**	X	X	X	X	X	X	X	X	X	X	X	No	
M687 agent (GB2)	**	No	X	X	X	X	X	X	X	X	X	X	X	
M449, M449A1, HE, ICM	**	X	X	X	X	X	X	X	X	X	X	X	No	
M483A1, HE, ICM	**	No	X	X	X	X	X	X	X	X	X	X	No	Firing below charge 3 may result in stickers
M864, HE, ICM, extended range	**	No	No	No	No	No	No	No	No	No	X	X	X	Firing below charge 3 may result in stickers. The M864 shall be fired to achieve ranges beyond the capabilities of the M483A1 projectile or when the M483A1 is not available.
M485A1, M485A2, illuminating	**	X	X	X	X	X	X	X	*	*	*	*	No	*M485A1 and M485A2 projectiles are not reliable when fired at charges 6, 7 and 8 with fuze settings of 10 seconds or less.

*May be fired for combat use only.

**Charge 1 must not be fired in the M199 cannon because of stickers. Firing at Charge 2 may result in stickers occasionally.

***M119A2 charge 7 is equivalent to M119/M119A1 charge 8. Refer to firing tables for small differences in velocity which affect range.

NOTE

PRIMER M82 is the only authorized primer to be used in the M199 cannon. M203 series charge 8 is not equivalent to M119/M119A1 charge 8.

Table 4-3. Authorized Projectile and Propelling Charge Combinations—Continued

	Propelling charge													
	(GB) M3 and M3A1					(WB) M4A1 and M4A2					M119	M119A1 and M119A2	M203 and M203A1	
Projectiles	Charge					Charge					Charge 8	Charge 7, 8***	Charge 8	Firing warnings
	1	2	3	4	5	3	4	5	6	7				
M549, HERA	**	No	No	No	No	No	No	No	No	X	No	X	No	The M549A1 may be fired with M203 series charge, but M549 must **never** be fired with M203 series charge.
M549A1, HERA ****	**	No	No	No	No	No	No	No	No	X	No	X	X	
M692, HE (ADAM)	**	No	X	X	X	X	X	X	X	X	X	X	No	Firing below charge 3 may result in stickers.
M731, HE (ADAM)	**	No	X	X	X	X	X	X	X	X	X	X	No	
M718, M718A1, AT (RAAMS)	**	No	X	X	X	X	X	X	X	X	X	X	No	Firing below charge 3 may result in stickers.
M741, M741A1, AT (RAAMS)	**	No	X	X	X	X	X	X	X	X	X	X	No	
M712, HEAT (Copperhead)	**	No	No	X	X	No	X	X	X	X	X	X	No	
M804, practice	**	X	X	X	X	X	X	X	X	X	X	X	No	

**Charge 1 must not be fired in the M199 cannon because of stickers. Firing at Charge 2 may result in stickers occasionally.

***M119A2 charge 7 is equivalent to M119/M119A1 charge 8. Refer to firing tables for small differences in velocity which affect range.

****Do not fire the M549/M549A1 projectiles if the obturating band is missing or broken. If the band is displaced and can be repositioned and remain in the groove, the projectile can be fired.

NOTE

PRIMER M82 is the only authorized primer to be used in the M199 cannon.

M203 series charge 8 is not equivalent to M119/M119A1 charge 8.

Table 4-3. Authorized Projectile and Propelling Charge Combinations – Continued

Projectiles	Propelling charge													Firing warnings
	(GB) M3 and M3A1					(WB) M4A1 and M4A2					M119	M119A1 and M119A2	M203 and M203A1	
	Charge 1	2	3	4	5	Charge 3	4	5	6	7	Charge 8	Charge 7, 8***	Charge 8	
M825, smoke (WP) *****	No	No	X	X	X	X	X	X	X	X	X	X	X	Firing below charge 3 may result in stickers. M825 projectiles are restricted to firing below 950 mils elevation with the M203 series charge. Firing this combination at elevations exceeding 950 mils may result in short rounds.

***M119A2 charge 7 is equivalent to M119/M119A1 charge 8. Refer to firing tables for small differences in velocity which affect range.

*****M825 projectiles (manufactured Jan 85 - May 86) fired at temperatures above +110°F (+43°C) (WP liquified) have resulted in flight instability and short rounds. This instability does not occur below +110°F (+43°C) (WP solid).

NOTE

PRIMER M82 is the only authorized primer to be used in the M199 cannon.

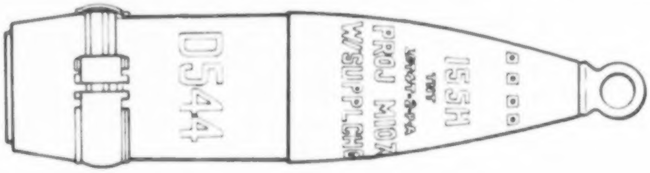
M203 series charge 8 is not equivalent to M119/M119A1 charge 8.

c. Projectiles of current manufacture with deep fuze cavities and supplementary charges of TNT are suitable for use with the long intrusion (M728 or M514 series) or the short intrusion (M732) proximity fuzes. The supplementary charge must be removed when the long intrusion proximity fuze is used; it must remain in place whenever any other authorized fuze is used.

d. Deep-cavity projectiles are identified by the words, W/SUPPL CHG, marked on the projectile. Weight zones are indicated on projectiles by one or more squares of the same color as the markings. Four squares indicate standard or normal weight for which no weight corrections are necessary when computing firing data. There may also be punch marks in the center of squares for night identification of weight zones by touch.

e. The authorized projectiles and their characteristics are as follows:

M107, M110 SERIES, M116 SERIES OR M121A1 PROJECTILE



(1) **Projectile, 155-mm, HE, M107.** This high-explosive (HE) projectile is used primarily for blast, fragmentation, and mining. This deep- or shallow-cavity projectile consists of a steel case loaded with TNT or composition B. A point-detonating, time, or proximity fuze may be used. The M107 projectile weighs approximately 95 pounds (43.09 kg).

WARNING

Since the burster in H or HD ammunition is loaded with tetrytol, do not store or fire at temperatures exceeding +125°F (+52°C). Temperatures above +125°F (+52°C) will cause the tetrytol to melt and/or seep, causing premature functioning.

(2) **Projectile, 155-mm, agent, H or HD, M110.** This projectile produces a toxic effect on personnel and is also used to contaminate habitable areas. This 93-pound (42.28-kg) projectile is filled with mustard gas (H) or distilled mustard gas (HD) and has a burster charge.

WARNING

The M121 projectile is no longer authorized. A few M121 (basic model) projectiles with tetrytol bursters may remain in some stock piles and should not be used, as inbore explosions may result.

(3) **Projectile, 155-mm, gas persistent, VX, M121A1.** This VX gas projectile produces a toxic effect on personnel. A burster charge breaks the projectile apart. The M121A1 has a composition B filled burster. This projectile weighs approximately 100 pounds (45.36 kg).

(4) **Projectile, 155-mm, gas, nonpersistent, GB, M121A1.** This projectile is similar to the VX projectile M121A1 described above.

WARNING

The filler in white phosphorous (WP) smoke projectiles melts at +111.4°F (+44.1°C) and creates voids inside the projectile. The WP projectiles must be stored base down so that any voids are in the nose of the projectile. Do not fire WP projectiles which are known to have been stored in other than a base down position. Firing of such projectiles could contribute to inbore explosions or close-in premature malfunctions.

Since the burster in the M110 and M110E1 projectiles is loaded with tetrytol, do not store or fire at temperatures above +125°F (+52°C). Temperatures above +125°F (+52°C) will cause the tetrytol to melt and/or seep, causing premature functioning. Prior to firing, inspect fuze well cup for dents in bottom surface. If dents are found or the fuze is hard to seat, do not use the round.

(5) **Projectiles, 155-mm, smoke, WP, M110 and M110E1.** The M110 and M110E1 white phosphorous (WP) smoke projectiles have a slight burning effect, but are used primarily to produce screening smoke. The projectiles are similar to the M110 gas projectile and have the same characteristics as the M107 HE projectile. Each projectile weighs approximately 98 pounds (44.55 kg).

(6) **Projectiles, 155-mm, smoke, WP, M110A1 (M110E2) and M110A2 (M110E3).** These projectiles are similar to the M110 and M110E1 white phosphorous projectiles, except that the burster is loaded with composition B5. These projectiles may be stored and transported at temperatures up to +145° F (+63° C). Inspection of the fuze well cup is required before firing.

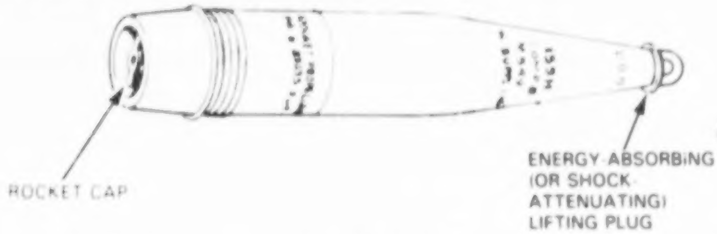
(7) **Projectiles, 155-mm, smoke, HC, M116 and M116B1.** The M116 and M116B1 smoke projectiles are used for screening, spotting, and signaling purposes and are issued with a filler of HC (white) chemical smoke mixture. These base-ejection (BE) rounds contain four smoke canisters. Each projectile weighs approximately 86 pounds (39.0 kg). These projectiles can use only the M501 series MTSQ fuze.

(8) **Projectiles, 155-mm, smoke, HC, M116A1.** The M116A1 projectile is a base ejection type similar to the M116 and M116B1 with the exception that it uses the M565 MT and M577 series MTSQ fuzes, and that it has improved M1 and M2 HC (white) smoke canisters.

WARNING
The M485A1 and M485A2 projectiles can be fired with charge 2 (M3 green bag) thru 8 (M119 series charges) inclusive. These projectiles are not reliable when fired at charges 6, 7, and 8 with fuze settings of 10 seconds or less.

(9) **Projectiles, 155-mm, illuminating, M485A1 and M485A2.** These projectiles are used for battlefield illumination. Each projectile has a hollow steel body containing a primary expelling charge, a canister assembly, and a drogue parachute. The canister assembly contains a secondary expelling charge, a delay holder, a light-producing chemical, and the main parachute.

M549 OR M549A1 PROJECTILE



(10) **Projectiles, 155-mm, HE, rocket assist, M549 and M549A1.**

(a) This is a high fragmentation projectile containing a rocket motor. The protective rocket cap **must be** removed from the projectile before firing to increase the range over that attainable ballistically. The M549 differs from the M549A1 only in the type of explosive filler. The M549 is loaded with composition B, and the M549A1 is loaded with TNT.

WARNING
A 6000-meter safety zone is required short of the target because of the possibility of rocket motor non-ignition.

The M549/M549A1 is not to be fired in the rocket off mode. The rocket cap must be removed prior to firing.

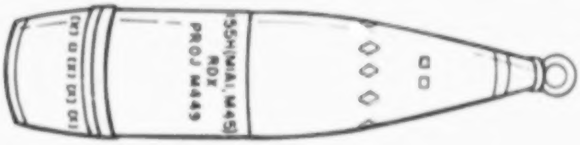
The M549/M549A1 is not to be fired if the obturator is missing or broken because it may result in a short round. If the band is displaced and can be repositioned and remain in the groove, the projectile can be fired. The basic M119 charge is not to be used with the M549/M549A1 projectile as its use will result in rocket motor ignition failure, causing loss of range (short rounds). Use M119A1 or M119A2 charges.

The M549/M549A1 is not to be fired in the M199 cannon if the 41.75-inch (106.05-cm) pullover gage reading indicates wear in the cannon exceeding 0.095 inch (0.24 cm).

(b) The M549/M549A1 projectiles have the energy-absorbing lifting plug designed to protect the projectile fuze area against accidental damage. The new plug has an oversized 3-3/4-in. (9.53-cm) flange. If this lifting

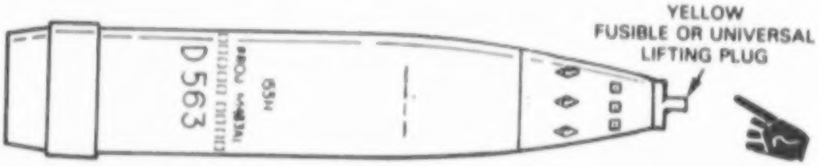
plug is broken at the neck area, the threaded portion of the plug will remain in the projectile and the projectile cannot be fuzed. No attempt should be made to extract any portion of a broken plug from a projectile; the projectile is not to be used and should be returned to supply point.

M449 SERIES PROJECTILE



(11) **Projectile, 155-MM, ICM, M449 Series.** These projectiles are improved conventional munitions (ICM) used primarily against personnel. The cargo consists of 60 M43 grenades which are ejected in flight. The fuze, having been set to function at a predetermined time, initiates the explusion charge, ejecting the entire cargo from the rear of the projectile. The projectile spins centrifugally and disperses the grenades from the projectile line-of-flight. Upon impact with the target area, an explusion charge is initiated which propels a high-explosive filled sphere upward 4 to 6 feet (1.22 to 1.83 m) above the impact area. The elevated sphere is detonated sending high-velocity fragments in a spherical pattern. Each projectile weighs approximately 95 pounds (43.09 kg).

M483A1 PROJECTILE



WARNING

The M483A1 projectile will not be fired below charge 3 in the M198 howitzer. Firing below charge 3 may result in stickers.

NOTE

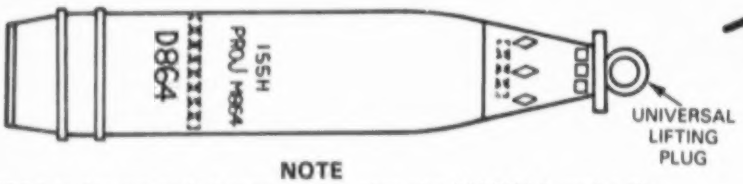
The M483A1 projectile or other projectiles using the M483A1 carrier may be fired with or without the obturating band. Remove and discard the band if broken. Remove or reposition if band is dislodged.

(12) **Projectile, 155-mm, ICM, M483A1**. This is a dual-purpose ICM projectile. It is effective against personnel and light materiel targets. These base-ejection type projectiles consist of a steel body containing an expelling charge and 88 shaped charge grenade submissiles. This projectile weighs approximately 103 pounds (46.72 kg) and uses the M577 series MTSQ fuze. It can be used in the fire-for-effect mode or the registration mode.

(a) In the fire-for-effect mode, the expelling charge ejects the 88 submissiles from the projectile during flight and they actuate on ground or target impact. A shaped charged jet is expelled downward while the body bursts into a large number of high-velocity fragments. The jet is capable of penetrating approximately 2.75 in. (6.98 cm) of homogeneous armorplate. Antipersonnel effects are obtained by fragmentation of the body.

(b) In the self-registration mode, the expelling charge is removed, and a projectile spotting charge is attached to the time fuze and installed in the projectile. The spotting charge will cause the projectile to detonate all 88 grenades inside the projectile, causing high fragmentation in the same manner as a standard high-explosive projectile. See page 4-24, paragraph 4-9c(2), for additional information on special preparation of the M483A1 projectile for use in the self-registration mode.

M864 PROJECTILE



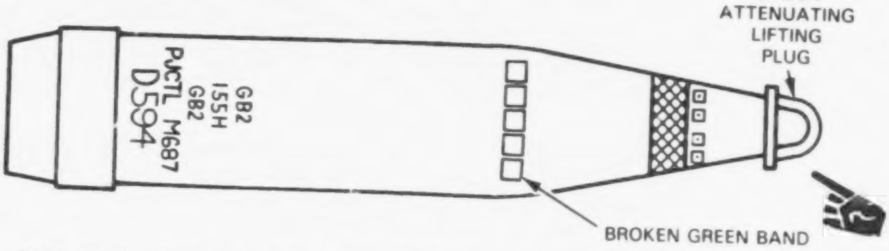
NOTE

The M864 is for extended range only. Use the M483A1 projectile through the M119A2 charge (Zone 7) where applicable. The M864 shall be fired to achieve ranges beyond the capabilities of the M483A1 projectile or when the M483A1 is not available.

The M864 projectile or other projectiles using the M483A1 carrier may be fired with or without the obturating band. If the obturating band is broken, remove and discard it. If it is dislodged, remove or reposition it.

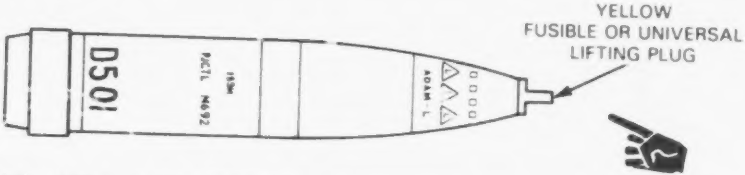
(13) **Projectile 155-mm, Extended Range, DP, M864.** This is an extended range dual-purpose, ICM projectile. The M864 is modeled after the M483A1 projectile with the addition of a base burner unit at the projectile's base. The propellant in the base burner ignites upon firing of the projectile, producing gases which reduce the drag on the projectile and extend its range. This is a base-ejection type projectile with a steel body. The expulsion charge contains 105 grams of M10 propellant. There are 72 shaped charge grenades consisting of 48 M42 grenades and 24 M46 grenades. They are effective against personnel and light materiel targets. This projectile weighs approximately 102 lbs (46.0 kg) and uses the M577 series MTSQ fuze. It can be used in the fire-for-effect mode or the self-registration mode.

M687 PROJECTILE


GB2
155H
GB2
PJCTL M687
D594
SHOCK ATTENUATING LIFTING PLUG
BROKEN GREEN BAND

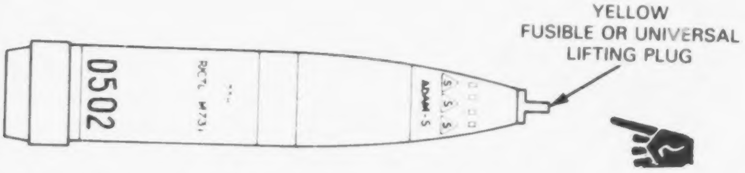
(14) **Projectiles, 155-mm, GB2, M687.** These projectiles are used to produce a toxic effect on personnel. The M687 is a binary projectile which requires assembly of the M20 canister prior to firing. The M20 canister is a separate issue item NSN 1320-00-407-8301 (D001). The M687 is assembled at the chemical ammunition supply point (CASP) per TM 3-1320-242-10 and will have a broken green band visible. If a rubber sleeve covers the broken green band, assembly of the M20 canister has not been accomplished and the projectile should not be fired.

M692 PROJECTILE


D501
PJCTL M692
ADAM-L
YELLOW FUSIBLE OR UNIVERSAL LIFTING PLUG

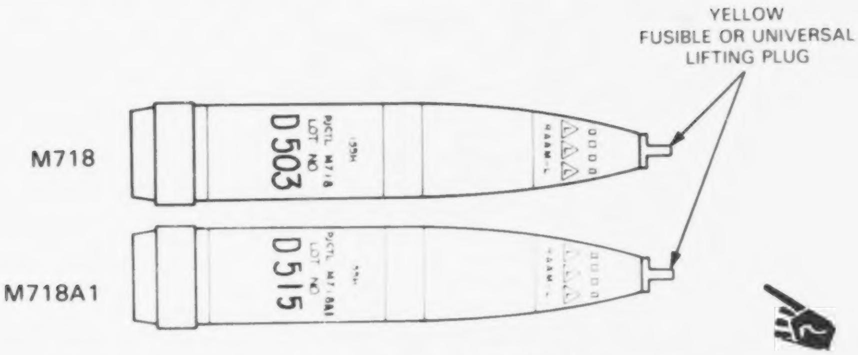
(15) **Projectile, 155-mm, HE, M692.** This high explosive (HE) projectile is known as the area denial artillery munition (ADAM). It is painted olive drab with yellow markings. The most significant marking on the ogive is the letter "L" appearing in the triangle, and in later production "ADAM L" on the ogive, indicating a long self destruct time of the antipersonnel mine submunitions. The M692 is a base ejection type projectile and uses the M577 series MTSQ fuze.

M731 PROJECTILE


D502
PJCTL M731
ADAM-S
S
S
S
YELLOW FUSIBLE OR UNIVERSAL LIFTING PLUG

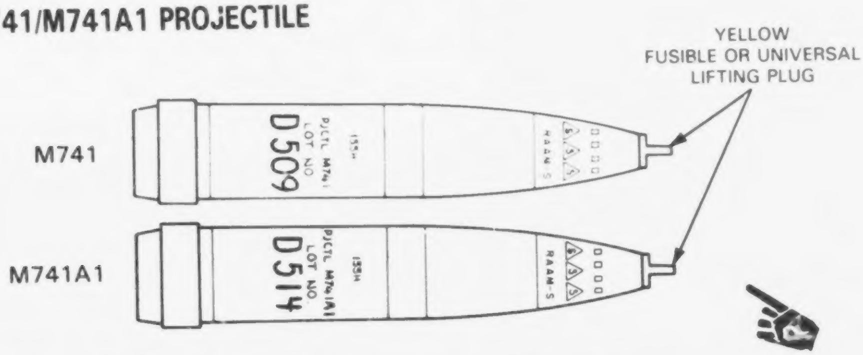
(16) **Projectile, 155-mm, HE, M731.** This projectile is like the M692 projectile, except the letter "S" appears within the yellow triangles, indicating short self destruct time of mine submunitions. This base ejection type projectile uses the M577 series MTSQ fuze.

M718/M718A1 PROJECTILE


YELLOW
FUSIBLE OR UNIVERSAL
LIFTING PLUG
M718
155H
P/CTL M718
LOT NO
D503
RAAM-L
M718A1
P/CTL M718A1
LOT NO
D515

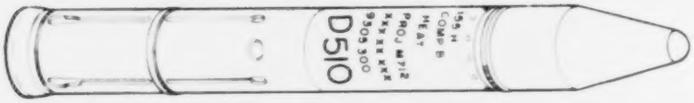
(17) **Projectile, 155-mm, AT, remote, anti-armor mine system, M718/M718A1.** This projectile is used to deliver high-explosive antitank mines in front of enemy armored forces to deny/delay access to a particular area for a specific time period. This projectile is from the family of scatterable mines and is known as the remote anti-armor mine system (RAAMS). It is painted olive drab with yellow markings. The most significant markings are the row of yellow triangles between the nose and the bourrelet which contain the letter "L" and "RAAM-L" on the ogive that indicate the LONG self-destruct time for the submunition. This is a base-ejection type projectile and uses the M577 series MTSQ fuze. The M718A1 projectile contains internal changes to the submunitions and has a new DODIC (D515); however, the projectile is handled and fired the same as the basic model.

M741/M741A1 PROJECTILE


YELLOW
FUSIBLE OR UNIVERSAL
LIFTING PLUG
M741
155H
P/CTL M741
LOT NO
D509
RAAM-S
M741A1
P/CTL M741A1
LOT NO
D514
RAAM-S

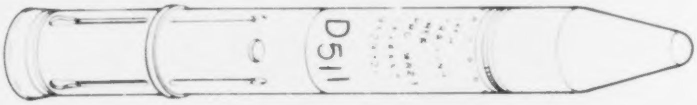
(18) **Projectile, 155-mm, AT, remote anti-armor mine system, M741/M741A1.** This projectile is also known as the RAAMS round, and it is exactly like the M718 above except the letter "S" painted in the yellow triangles and "RAAM-S" on the ogive are different to indicate a SHORT self-destruct time. This is a base-ejection type projectile and uses the M577 series MTSQ fuze. The M741A1 projectile contains internal changes to the submunitions and has a new DODIC (D514); however, the projectile is handled and fired the same as the basic model.

M712 PROJECTILE



(19) Projectile, 155-mm, HEAT, M712. This projectile is a cannon launched guided projectile. It is a high explosive antitank (HEAT) projectile loaded with 14.75 pounds (6.69 kg) of composition B. It is guided to its target by a laser beam directed on the target from a laser designator. The projectile has five time and code switches set by the crew prior to firing. The warhead section of the projectile contains its own base detonating fuze (M740). The projectile is 54 inches (137.16 cm) long and weighs 138 pounds (62.60 kg). Details on use of M712 projectile begin on page 4-50.

M823 PROJECTILE



WARNING

The M823 projectile must not be fired. Such firing could be a hazard to personnel forward of the weapon.

(20) Projectile, 155-mm, training, M823. This projectile is designed to train 155-mm howitzer weapon crews in the handling and setting of the M712 projectile. It simulates the M712 in weight, center of gravity, and external appearance. It contains code and time switches which are set to simulate prefiring activity by the crew. It is shipped and stored in the same container as the M712, color coded bronze for easy identification. Details on use of M823 projectile begin on page 4-51.

M825 PROJECTILE

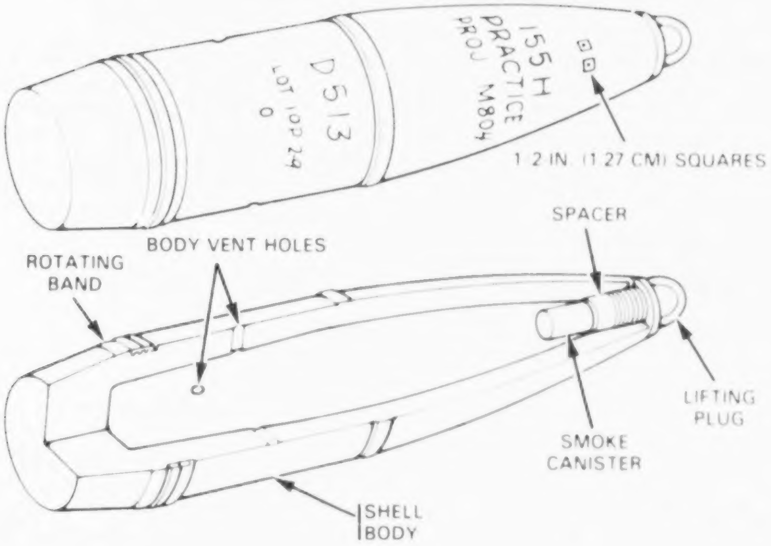
WARNING

White phosphorous (WP) impregnated felt wedges from the M825 are not totally consumed when the WP burns. When the unburned felt wedges are crushed or moved, residual WP will re-ignite, posing a burn hazard. Personnel should not contact or move the unburned felt wedges.

(21) Projectiles, 155-mm, smoke, WP, M825. The M825 projectile consists of a modified M483A1 projectile carrier with a payload of white phosphorous impregnated felt wedges. Inflight fuze functioning ejects a canister. A burster inside the canister scatters burning wedges over the target area producing obscuring smoke. This projectile uses the 577 series MTSQ fuze.

155H
PROJ M825
D528

M804 PROJECTILE


155 H
PRACTICE
PROJ M804
D513
LOT 10P 24
0
1/2 IN. (1.27 CM) SQUARES
SPACER
BODY VENT HOLES
ROTATING BAND
LIFTING PLUG
SMOKE CANISTER
SHELL BODY

(22) **Projectile, M804, practice**. The M804 projectile is used in place of the M107 HE projectile in training exercises. The M804 contains a small smoke canister in the fuze well which provides flash and smoke for visual determination of functioning. The M804 is similar in weight and external configuration to the M107 HE projectile and can be used in training without the blast and fragmentation which accompany functioning of an M107 HE projectile. The body of the M804 contains four holes, 90 degrees apart, which serve to disperse smoke on functioning.

4-4. AUTHORIZED FUZES

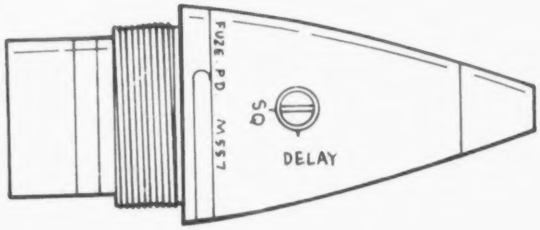
Paragraphs a thru i describe the fuzes to be used with this weapon. They are in model number sequence. For additional information and more detailed descriptions and functioning of the authorized fuzes, see TM 43-0001-28.

WARNING
The firing of a field artillery round without a fuze or with an unauthorized fuze is strictly prohibited as an inbore explosion may result.

M78 OR M78A1 FUZE AND M25 BOOSTER

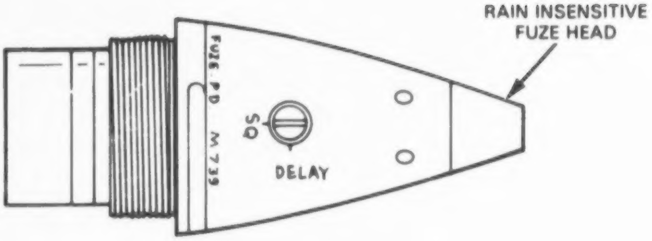
Deleted.

M557 AND M572 FUZE



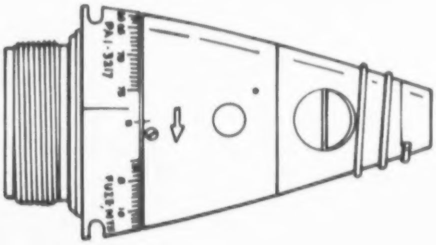
b. **Fuze, Point-Detonating, M557/M572.** The M557 has a selective superquick delay setscrew. It is packed set for superquick and has a booster attached. Premature functioning can occur when fuzes are fired in heavy precipitation, i.e., heavy rainfall, sleet, snow, or hail. The M572 fuze is the M557 fuze with the addition of epoxy under the windshield. It is handled, set, and fired the same as the M557 fuze.

M739 OR M739A1 FUZE



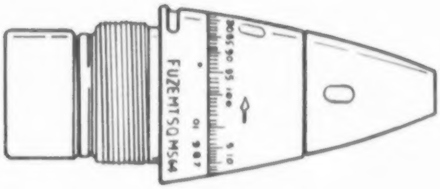
c. **Fuze, Point-Detonating, M739 and M739A1.** These fuzes are the latest improved versions of the selective impact fuze. These fuzes have solid aluminum bodies with threaded bases. The fuzes contain a rain-insensitive screen so that the fuzes can be fired through a heavy rainstorm without premature functioning of the round of ammunition. These fuzes can be set for superquick or delay action by turning the setscrew. The M739A1 fuze contains a new impact delay module which provides more effective functioning in the delay mode. In addition to the stamped markings, the M739A1 fuze is anodized green for positive identification of fuze model.

M501A1 OR M501 FUZE



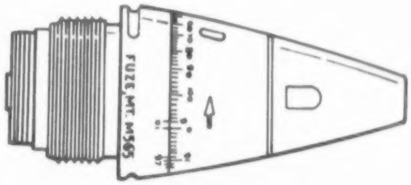
d. **Fuze, Mechanical Time and Superquick, M501A1 and M501.** The M501A1 or M501 fuze is a combination mechanical time and superquick (MTSQ) fuze with settings for time action (2 to 75 seconds) and an impact element for superquick action. It is used only with the M116 and M116B1 smoke rounds.

M564 FUZE



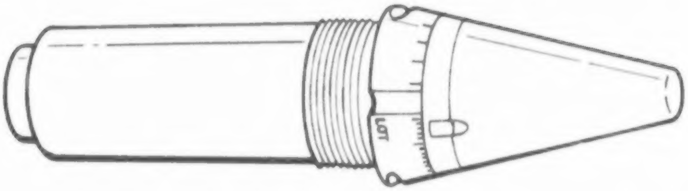
e. **Fuze, Mechanical Time and Superquick, M564.** This fuze is an improvement over the older MTSQ fuzes, because it provides a longer timing mechanism (100 seconds) for functioning at longer ranges. The date of manufacture is stamped on the fuze body before the lot number. Fuzes manufactured through 1969 must be set on 90 seconds if superquick (impact) action is desired. Setting of these fuzes between S and 2 seconds may result in functioning after approximately 2 seconds. Fuzes manufactured from 1970 on may be set as shipped on S for superquick (impact) functioning. Premature functioning of this fuze may occur downrange when the fuze is fired in heavy precipitation, i.e., heavy rainfall, sleet, snow, or hail.

M565 FUZE



f. **Fuze, Mechanical Time, M565.** The M565 mechanical time (MT) type is similar to the M564 MTSQ fuze, except that the M565 fuze does not contain the point-detonating assembly or the booster assembly. The M565 fuze can be set from 2 to 100 seconds. Like the M564 fuze, the M565 fuze has a vernier scale to assure a setting accuracy of 0.1 second. The fuze is used with base-ejection projectiles only.

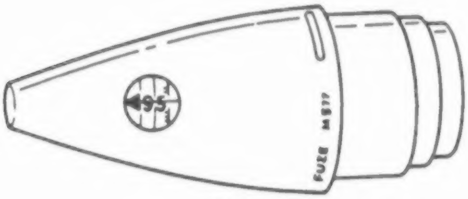
M728 FUZE AND M514 SERIES FUZE



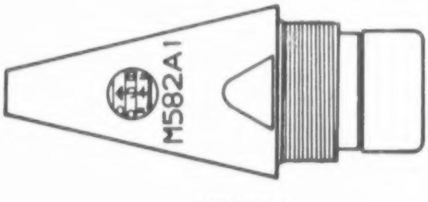
WARNING
The M728 and M514 series fuzes are not to be used with the M203/M203A1 propelling charge.

g. **Fuze, Proximity, Variable Time, M728 and M514 Series.** These proximity variable time (VT) fuzes are used with deep-cavity projectiles and are essentially self-powered radios and transmitting units. The fuzes can be set from 5 to 100 seconds.

M577 SERIES OR M582 SERIES FUZE



M577



M582A1

h. **Fuzes, Mechanical Time and Superquick, M577 Series and M582 Series.**

(1) These fuzes have a 200-second mechanical time mechanism with three movable digital dials similar to a speedometer. Each fuze has a window through which the dials are viewed. The dials permit setting of the fuze to the nearest tenth of a second. The M577A1 and M582A1 MTSQ fuzes contain a different mechanism for point detonating action. Externally the major difference is the configuration of the wrench slots. The M577A1 and M582A1 fuzes are handled, set, and fired the same as the basic models. Early manufactured basic and A1 fuzes have black (paint finish) ogives while the later produced A1 fuze has a gold (chromate finish) ogive.

(a) The dial closest to the fuze nose indicates the time in hundreds of seconds. (The triangle (◄) position is a nontime setting.)

(b) The second dial indicates time in tens of seconds.

(c) The third dial indicates the nearest second and also tenths of seconds by using the scale on the right edge of the dial.

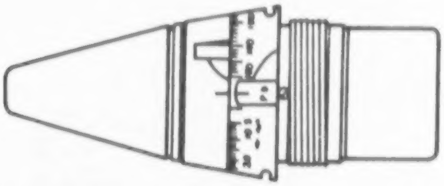
(2) These fuzes can be set with the M35 fuze setter or a flat-tip screwdriver. The time-setting key is located on the end of the fuze nose. The desired time is set under the hairline. Detailed setting instructions are outlined in paragraph 4-11 (p 4-30).

(3) The M577 series does not contain a booster and is used with base-ejection projectiles. The M582 series fuze is fitted with a booster for firing with burster-type and high-explosive projectiles. In order to minimize identification problems, current production of the M582A1 fuzes contain a white stencil "M582A1" below the window in the fuze body.

(4) The fuzes are not sensitive to rain.

(5) The M577 series fuze can be used with a spotting charge when firing the M483A1 and M864 projectiles in the self-registration mode.

M732 FUZE



i. **Fuze, Proximity, Variable Time, M732.** This proximity variable time (VT) fuze is a short-intrusion fuze of the same overall length as the standard impact or mechanical time fuze. The supplementary charge must be left in the fuze well for proper functioning of this fuze. This fuze has a time ring that can be set from 0 to 150 seconds.

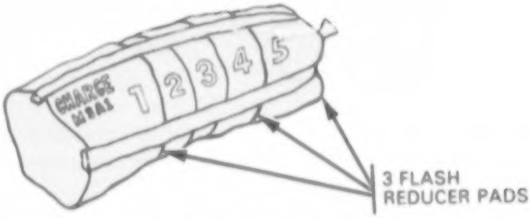
NOTE

The PD setting of the M732 VT fuze, when fired into soft impact areas, will produce less lethality than the superquick setting of the M739 series PD fuze.

4-5. PROPELLING CHARGES

The following are authorized propelling charges.

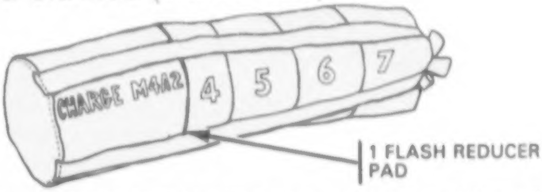
M3A1 PROPELLING CHARGE (GREEN BAG)



a. **Propelling Charge, M3A1.** This is a green bag charge divided into a base and four increments for firing in charges 1 thru 5. It has a flash reducer pad assembled in front of the base charge with similar 1-ounce (28.30-g) pads assembled in front of increments 4 and 5. The increment bags are tied together by cloth straps. A clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section. Some propelling charges may have primer MK2A4 packed inside the container. This primer is not authorized for firing in M199 cannon (M198).

b. **Propelling Charge, M3.** This is a green bag charge similar to the M3A1 propelling charge, except it is not assembled with flash reducer pads, and black powder is used in the igniter pad. Some propelling charges may have primer MK2A4 packed inside the container. This primer is not authorized for firing in M199 cannon (M198).

M4A2 PROPELLING CHARGE (WHITE BAG)

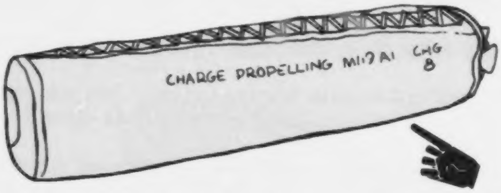


c. **Propelling Charge, M4A2.** This is a white bag charge consisting of a base charge and four increments for firing in charges 3 thru 7. The increments are tied together by cloth straps. A clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section. It has a flash reducer pad assembled in front of the base charge. Some propelling charges may have primer MK2A4 packed inside the container. This primer is not authorized for firing in M199 cannon (M198).

d. **Propelling Charge, M4A1.** The M4A1 propelling charge is identical to the M4A2 propelling charge, except that it does not contain a flash reducer, and the base igniter contains black powder instead of a clean-burning igniter charge. The M2 flash reducer may be used with this charge and is a separate item of issue. Some propelling charges may have primer MK2A4 packed inside the container. This primer is not authorized for firing in M199 cannon (M198).

e. **Propelling Charge, M4.** This is a white bag charge identical to the M4A1 propelling charge, except that it is designed for firing in charges 5 thru 7 only and consists of a base charge and two increments. The M2 flash reducer is also used with this charge. Some propelling charges may have primer MK2A4 packed inside the container. This primer is not authorized for firing in M199 cannon (M198).

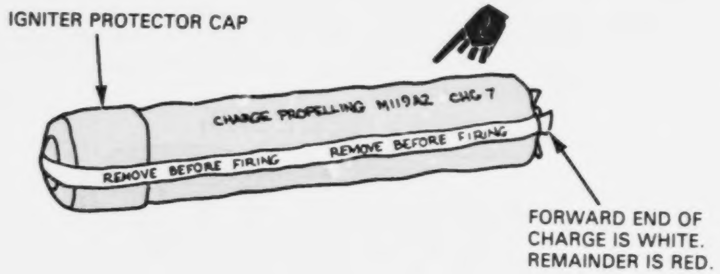
M119A1 PROPELLING CHARGE (WHITE BAG)


CHARGE PROPELLING M119A1 CHG 8

f. **Propelling Charge, M119.** This is a single charge 8. This white bag charge consists of only one charge with an igniter bag sewn on the base and a flash reducer on the front of the charge.

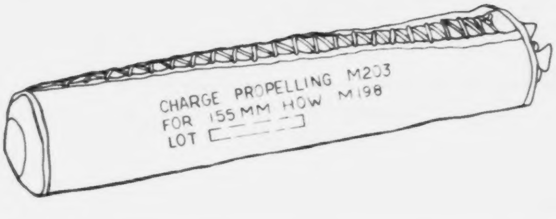
g. **Propelling Charge, M119A1.** This charge is identical in appearance to the M119 propelling charge. It is a single charge 8. It contains some design improvements including a modified flash reducer. The modified flash reducer allows firing of this charge with the M549 and M549A1 projectiles.

M119A2 PROPELLING CHARGE


IGNITER PROTECTOR CAP
CHARGE PROPELLING M119A2 CHG 7
REMOVE BEFORE FIRING
REMOVE BEFORE FIRING
FORWARD END OF CHARGE IS WHITE. REMAINDER IS RED.

h. **Propelling Charge, M119A2.** This charge differs in appearance from the M119A1 in that it has no lacing jacket and the charge bag is red. It is a base ignited zone 7 charge with an igniter pad sewn on the base and a flash reducer which lines the side of the charge. Like the M119A1, it can be fired with the M549/M549A1 projectile. The igniter protector cap and tie strap must be removed prior to firing the charge. The M119A2 zone 7 is equivalent to the M119/M119A1 zone 8 charge.

M203 PROPELLING CHARGE (RED BAG)



WARNING

When firing the M203 charge (red bag) or M203A1 charge the following restrictions must be observed:

a. Foam earplugs must be properly worn.
b. No more than 12 rounds should be fired in a given 24 hour period by any one crew or one individual crew member. If more than 12 M203 series charges are fired, all personnel must stand 25 feet (7.62 m) or more behind rear of cannon and a 25-foot (7.62-m) lanyard must be used.
c. A 55-inch (1.397-m) clearance must exist between breech and ground along the recoil path prior to firing at elevations in excess of 800 mils.
d. Allowable Number Of Rounds Per 24-hour period - By Charge (with hearing protection).

M203 Series -	12
M119 Series -	32
M4 Series -	144
M3 Series -	1000

e. Deleted.
f. Deleted.

NOTE

These recommended limits are mutually exclusive; e.g., 12 rounds M203 series, or 32 rounds M119 series, or 144 rounds M4 series, or 1000 rounds M3 series per 24 hour continuous time period.

i. **Propelling Charge, M203.** The M203 propelling charge is a charge 8 propelling charge developed for extended range in long-tube (M199) 155-mm howitzers. This red bag charge consists of one increment with an igniter bag sewn on its base, a central core igniter extending through the center of the charge, and a flash reducer in front of the charge. The entire length of the charge is encased in a tight-fitting lacing jacket for added strength and stability.

NOTE

Early production of M203 charges are marked charge 8S (i.e., super). Later production M203 charges are marked charge 8. The charges are ballistically equivalent and should be identified as charge 8 red bag.

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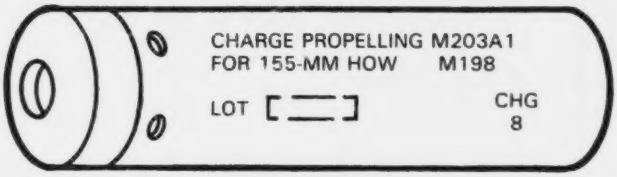
M203A1 PROPELLING CHARGE



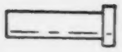
j. **Propelling Charge, M203A1**. The M203A1 propelling charge like the M203 is a charge 8 propelling charge developed for extended range in long-tube (M199) 155-mm howitzers. This charge consists of one increment of stick propellant and a base igniter pad encased in a full length rigid combustible cartridge case. The charge also contains a wear reducing additive and a lead foil decoppering agent. The M203A1 charge 8 is ballistically equivalent to the M203 red bag charge 8.

4-6. PRIMER, M82

WARNING

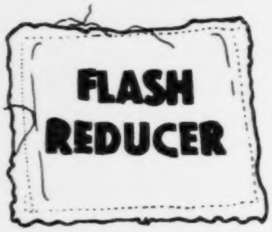
The M82 is the only primer authorized for firing in M199 cannon (M198). DO NOT FIRE THE MK2A4 IN THESE CANNONS. TURN THEM INTO THE AMMUNITION SUPPLY POINT.

M82 PRIMER



4-7. FLASH REDUCER, M2 (T2)

M2 FLASH REDUCER



The flash reducer pads serve to limit breech flashback, as well as muzzle flash and blast overpressure. This flash reducer consists of a red cotton cloth bag 4 inches (10.16 cm) square, containing black powder and potassium sulfate or potassium nitrate. The M2 flash reducer, which is a separate item of issue, may be used with the M4 or M4A1 propelling charge if flash reduction is desired. In preparing an M4 and M4A1 white bag propelling charge for firing, one flash reducer is added in front of the base charge and one in front of each increment used.

Section II. PREPARATION FOR FIRING

4-8. GENERAL

NOTE

Ammunition components are handled by cannoneers no. 2, 3, 4, 5, 6, and 7.

a. **Temperature Limits.** Unless otherwise specified, observe the following temperature limits when firing:

WARNING

To ensure that the projectile upper temperature limit stays below +125°F (+52°C), it must be shaded when the weather is expected to be hot, i.e., the outside temperature is expected to exceed +100°F (+38°C) during the day.

(1) Lower limit is −40° F (−40° C).

(2) Upper limit is +125° F (+52° C).

b. **Packing and Unpacking Ammunition Components.** Retain packing materials for repackaging, as required.

WARNING

The M82 primer is the only authorized primer to be used in the M199 cannon. Do not use the MK2A4 primer in these tubes. The propellant may not ignite.

(1) The M3 series propelling charges are packed two per metal container, with or without the MK2A4 primer. The M4 series, M119, M119A1, M119A2, M203 and M203A1 propelling charges are packed one per metal container.

(2) The M82 primers are packed one per waterproof bag. Primers are ready for firing when unpacked and should be protected from blows that might cause accidental functioning.

(3) The M2 (T2) flash reducers are packed 200 per metal container (four containers, 800 flash reducers per wooden box).

(4) Fuzes are generally packed in metal boxes. The metal boxes are then packed in wooden boxes.

c. **Procedures.** Inspect ammunition components and verify item identification.

WARNING
Inspect your ammunition. Failure to accomplish required inspections can result in unnecessary malfunctions.

CAUTION
Do not use axes, crowbars, etc, which may damage ammunition or packaging.

(1) Unpack ammunition and perform inspections indicated in paragraph 4-21 (p 4-45).

(2) Return all defective ammunition to ammunition supply point.

4-9. PREPARATION FOR FIRING

Preparation for firing the four components of a complete round of 155-mm ammunition requires efficient teamwork among the cannoneers. They must quickly and accurately select, unpack, inspect, and prepare the correct primer, propellant, projectile, and fuze from the fire commands received by the howitzer section. The chief of section must thoroughly cross-train the entire crew so that any crewman can perform any or all of the duties required of any other members.

a. **Primer, M82.** Do not open moisture protective bag until ready to use the primer. Cannoneer no. 1 loads the primer.

b. **Propelling Charges.**

(1) Propelling charges come packed in hermetically sealed metal containers. There is one complete charge in each container of the M4 series, M119 series, and the M203 red bag charges. The M3 series green bag charges are packed with two complete charges in each metal container. Check for the following when preparing the propellant for firing:

(a) Select the right charge announced in the fire command.

(b) Unpack the charge from the metal container, and inspect the charge for torn cloth, loose powder grains, or discoloration of the cloth bags.

(b.1) For M203A1 propelling charge only, pull pull-straps until the buttons on the base igniter assembly clear the mouth of the container. Grasp charge around the buttons and pull charge out of the container supporting it along its length to avoid dropping the charge. Charges which have severely crushed or distorted cases and/or contain missing or broken propellant are not to be fired.

(c) Remove the igniter cap and inspect the red igniter pad. The pad should not be torn or wet. The igniter powder grains are highly hygroscopic (will absorb moisture); the grains could stick together, which could cause misfires. The igniter powder grains should move freely inside the pad to show that they are not stuck together.

(d) Check the smell of the powder charge and its container. There should not be a sour, acid smell as this indicates the charge was previously wet. There should be a sweet, ether-like smell, indicating that the charge is fresh.

(e) Remove any excess powder increments (those increments with a higher number than called for in the fire command), and retighten the tie straps so that all powder increments are secure, with the highest numbered charge (per fire command) on top.

(f) Place the unused powder increments in a secure container and dispose of them later by burning under the supervision of an officer.

(2) Deleted.

(a) Deleted.

(b) Deleted.

(c) Deleted.

c. **Projectile**. Projectiles for this howitzer normally come packed eight to the pallet, with the top and bottom of the wood pallets banded together. Each projectile has an eyebolt lifting plug and a grommet attached for protection during shipping and handling activities. For preparation of M712 projectiles (Copperhead), see page 4-51.

NOTE

These procedures apply to all projectiles, except for the M483A1 and M864 projectiles when fired in the self-registration mode.

(1) Preparation of projectiles. Select the right projectile announced in the fire commands and prepare it for firing as follows:

(a) Inspect and clean projectile.

1. Verify that the projectile is the type designated by the fire commands.

NOTE

A projectile with a burred rotating band will be put aside until the burrs can be removed with a file.

2. Remove the grommet and examine the rotating band to ensure that it is free from all dirt and burrs.

3. Remove the eyebolt lifting plug and gasket and examine the fuze well for leaks or damage to the filler. If any high-explosive filler residue clings to the threads of the fuze well, the round is rejected and another one is used to complete the fire mission.

WARNING

Dirt or grease left on the projectile rotating band could cause failure of the projectile to seat properly in the forcing cone. Firing an unseated projectile could result in an inbore explosion causing injury or death.

NOTE

Any sand, dirt, oil, or grease left on the projectile will cause wear, scratches, or gouges in the bore.

4. Examine the entire projectile for defects and check to see that the projectile is not damaged or corroded and is free of dirt, grease, sand, and oil. Slight rust on the projectile is acceptable.

(b) Hold the projectile upright for fuzing and fuze setting.

1. Deleted.

2. Deleted.

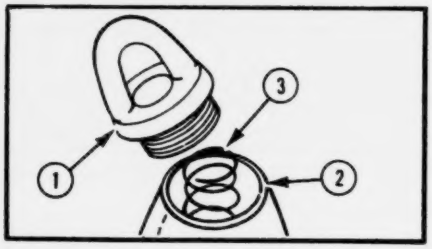
(c) Deleted.

(2) **Special preparation of the M483A1 and M864 projectiles for use in the self-registration mode.** When the command for use of the M483A1 or M864 ICM projectile includes the self-registration mode, the expulsion charge inside the nose of the projectile must be removed and a projectile spotting charge threaded on to the fuze as follows:

EXPULSION CHARGE ASSEMBLY

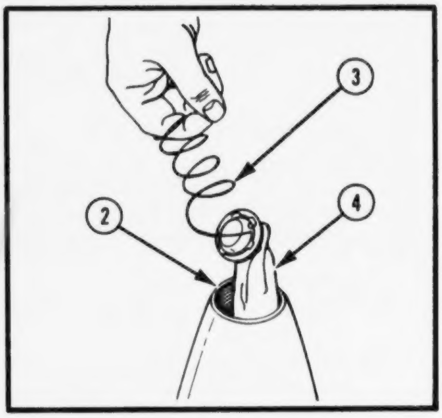
REMOVAL

1 Remove the fusible lifting plug (1) with attached gasket and inspect the fuze well (2). When the lifting plug is removed, the compressed coiled pull-wire (3) will expand and protrude beyond the fuze well of the projectile ogive.

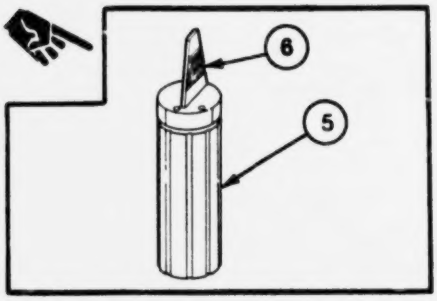


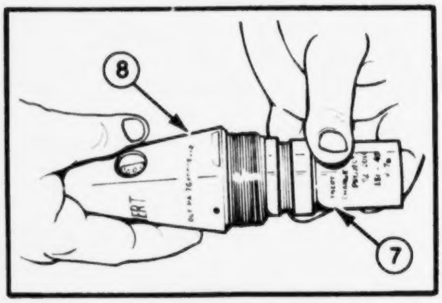
EXPULSION CHARGE ASSEMBLY–Continued

2 Remove the bagged expulsion charge assembly (4) by grasping and firmly pulling the pull-wire (3). If the projectile is assembled with the cylindrical plastic expulsion charge (5), remove it by pulling the tab (6). Set charge assembly aside for disposition. Visually inspect the fuze well (2) for loose grains of propellant or other foreign material. Remove any loose material.



3 Obtain an M577 series fuze (8) and a projectile spotting charge (7).





WARNING

When screwing the projectile spotting charge (7) on to rear of the M577 series fuze (8) ensure that shoulder of projectile spotting charge is seated squarely against shoulder of fuze. An improperly seated charge could cause a malfunction.

CAUTION

When assembling projectile spotting charge to fuze, exercise care to avoid damaging threads. If binding occurs, consider charge unserviceable and report it for disposition. If binding has occurred, reinspect fuze to assure it is still serviceable.

4 If firing the M483A1 or M864 projectile in the self-registration mode, screw the projectile spotting charge (7) handtight onto the M577 series fuze (8) (left-hand thread).

4-10. FUZES

a. **General.** There are three basic types of fuzes: impact, mechanical time, and proximity variable time (VT) fuzes. On the command, FUZE (type of fuze), select the right type, unpack, inspect, and install it in the projectile, and set it as commanded (TIME, SUPERQUICK, DELAY).

b. **Lifting Plug Removal.**

WARNING

Do not use a projectile with explosive on the threads or evidence of explosive powder seepage. It could cause detonation of the projectile if fired.

(1) Remove plug and inspect the filler beneath the plug.

(2) Inspect the cavity and projectile threads for damage. Remove loose material from cavity. If any high explosive is found stuck to the threaded portion of the projectile throat, do not fire.

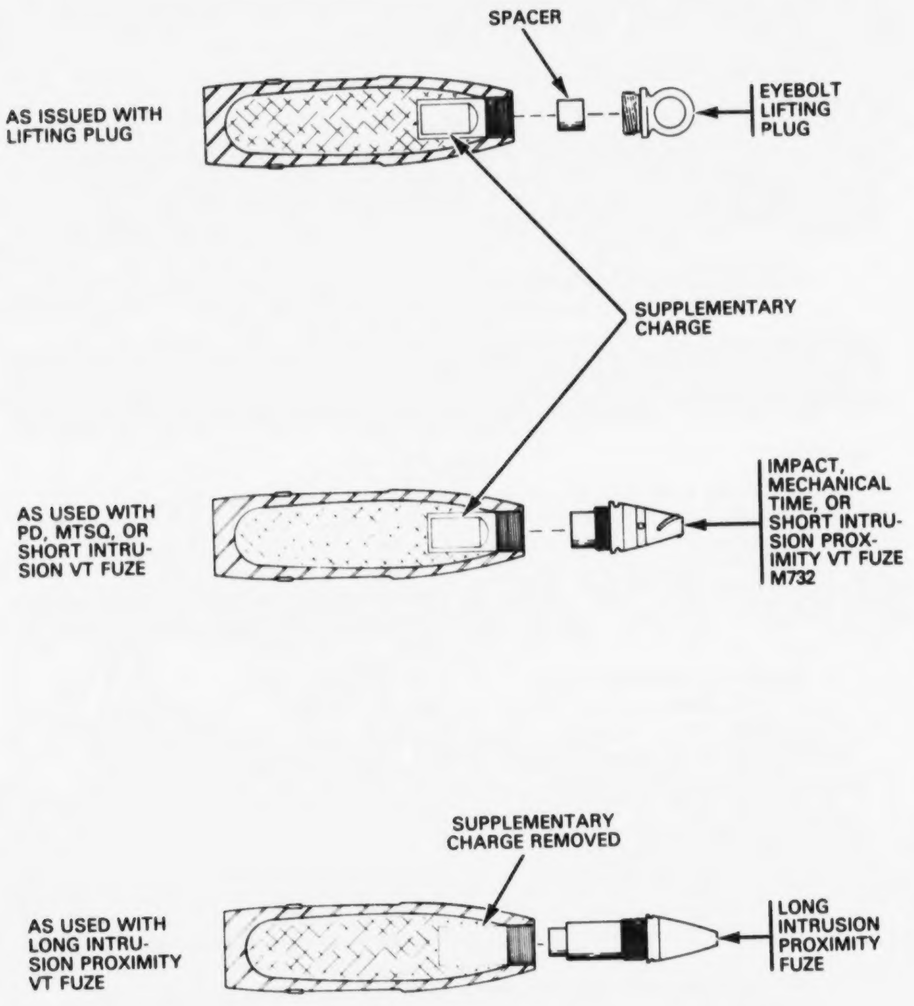
WARNING

Do not use the M549/M549A1 projectile if the lifting plug has been broken. Do not attempt to extract any portion of the plug from the fuze well of the projectile. Return projectile to the supply point.

Do not fire point-detonating (PD), mechanical time and superquick (MTSQ), or the short intrusion variable time (VT) fuzes in a deep-cavity projectile without the supplementary charge as an inbore explosion may result.

Do not attempt to remove supplementary charge by any means other than the lifting loop. Use of screwdrivers or other tools to remove the charge by force is dangerous.

TYPICAL DEEP-CAVITY PROJECTILES


SPACER
AS ISSUED WITH LIFTING PLUG
EYEBOLT LIFTING PLUG
SUPPLEMENTARY CHARGE
AS USED WITH PD, MTSQ, OR SHORT INTRUSION VT FUZE
IMPACT, MECHANICAL TIME, OR SHORT INTRUSION PROXIMITY VT FUZE M732
SUPPLEMENTARY CHARGE REMOVED
AS USED WITH LONG INTRUSION PROXIMITY VT FUZE
LONG INTRUSION PROXIMITY FUZE

c. **Supplementary Charge.** For the long intrusion proximity fuze firings, remove supplementary charge by means of its lifting loop. If the charge cannot be removed by its lifting loop, either fire with a short intrusion VT, PD, or MTSQ fuze or dispose of the round.

d. **Fuze Assembly.** The following procedures apply to all fuzes. See paragraph (3) for special instructions for the M577 series fuzes.

(1) Assembly of fuze to projectile.

WARNING

When tightening fuze to projectile, do not hammer on fuze-setter wrench or use extension handle on fuze-setter wrench. Do not stake fuze to projectile under any circumstances. Shocks transmitted to a fuze during assembly may cause a malfunction.

(a) Screw fuze in by hand. If binding occurs, inspect fuze cavity and threads of both fuze and projectile. Reject whichever is at fault.

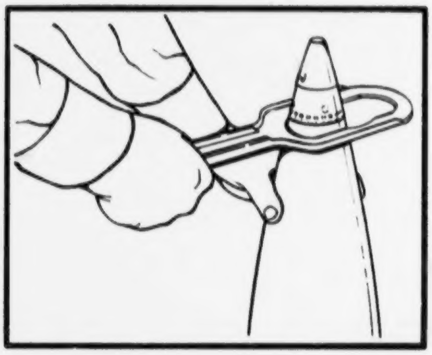
WARNING

Rounds fired without a fuze or with improperly seated fuzes may result in premature functioning.

NOTE

For proximity fuzes with a gap between the fuze shoulder and projectile, either replace the supplementary charge and fire with impact PD, MTSQ, or short intrusion VT fuze or dispose of round.

(b) After assembling fuze by hand, back fuze off 1/4 turn. Using the M18 fuze-setter wrench, tighten fuze to projectile with a sharp snap of the wrench so that the fuze shoulder is seated firmly against the projectile nose.



(c) If projectile setscrew is present, tighten to below level of contour of projectile.

(2) Deleted.

CAUTION

Deleted.

NOTE

Deleted.

(a) Deleted.

(b) Deleted.

WARNING

When screwing the projectile spotting charge on to the rear of the M577 series fuze, ensure that the shoulder of the projectile spotting charge is seated squarely against the shoulder of the fuze. An improperly seated charge could cause a malfunction.

CAUTION

When assembling the projectile spotting charge to a fuze, be careful not to damage threads. If binding occurs, consider the charge unserviceable and report it for disposition. If binding has occurred, reinspect the fuze to ensure it is still serviceable.

(3) **Special preparation for the M577 Series fuze.** Inspect the fuze setting. The fuze will be considered unserviceable if the setting is not between ◄93.5 and ◄95.5, the fuze shows signs of damage, or the window is blackened or sooty inside.

4-11. FUZE SETTING

The following procedures apply to all authorized fuzes. Fuze-setting tools and procedures are listed in table 4-4.

Table 4-4. Fuze, Fuze-Setting Tools, and Procedures

Fuze								
PD		MT	MTSQ			Prox		
M572 and M557	M739 series	M565	M564	M501 series	M577/M582 series	M732/M728/M514	Setter	Procedure number
	Deleted.						Deleted.	Deleted.
X	X						Fuze-setter wrench, M18	1
						X	M27	2
		X	X				M34	3
					X		M35	4
				X			M27	5

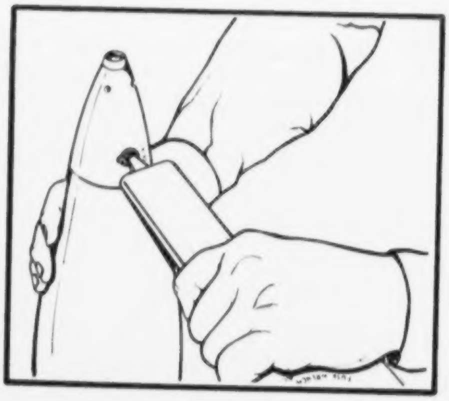
a. **Procedure Number 1, Fuzes, M572, M557 and M739 series.**

NOTE

Point-detonating (PD) fuzes with superquick (SQ) or delay functioning are shipped for SQ action.

(1) If superquick action is desired, check the setting to make sure it is set at SQ.

(2) To set fuzes for delay action, use screwdriver end of the M18 fuze-setter wrench or similar tool and turn slot 1/4 turn to aline with index mark indicating DELAY.



b. Procedure Number 2, Fuzes, M728, M514 Series, and M732.

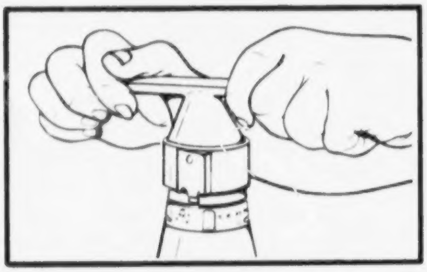
CAUTION

Plastic nose cones rotate with index mark. Damage to plastic will produce duds. However, since there is no backlash, fuze setting can be accomplished or changed one or more turns with no harmful effect. If counterclockwise rotation is used, be sure that the fuze has not come loose from the projectile.

NOTE

M514 series and M728 fuzes are shipped with the index mark on the nose cone set at 10 seconds. M732 fuze is shipped with the index mark aligned with PD.

(1) To set fuze for proximity action, rotate nose cone with the M27 fuze setter, normally in clockwise direction while looking down on the nose of the fuze, until the index mark coincides with the announced time. The fuze setting can be changed one or more times with no harmful effects.



(2) For impact functioning of the M514 series, M728 and M732 fuzes, set fuzes to 90 seconds using the M27 fuze setter.

(3) The fuze is set when index line at base of nose cone is alined with the time, in seconds, engraved on base of fuze.

WARNING

Do not fire projectile unless fuze is fully seated. Inbore explosion may result.

NOTE

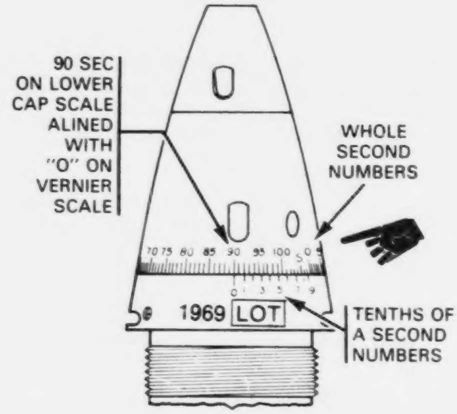
Firing the M728 fuze above charge 7 may result in excessive impact (PD) duds.

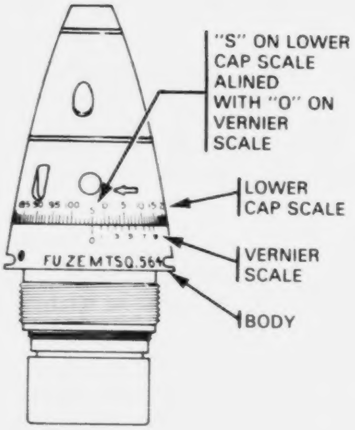
(4) Firing temperature limits for M728 and M732 proximity fuzes are −40° to +140°F (−40° to +60°C) and 0° to +120°F (−18° to +49°C) for M514 series fuzes.

NOTE

Do not attempt to set the fuze until just before firing.

c. **Procedure Number 3, Fuzes, M565 and M564.** The following procedures include instructions for setting the fuze for superquick (impact) action and airburst (time) and for meeting safety requirements. If the M564 fuze is to be fired for superquick action (impact) only, first check the year of manufacture stamped on the fuze body, then follow instructions below, as appropriate.

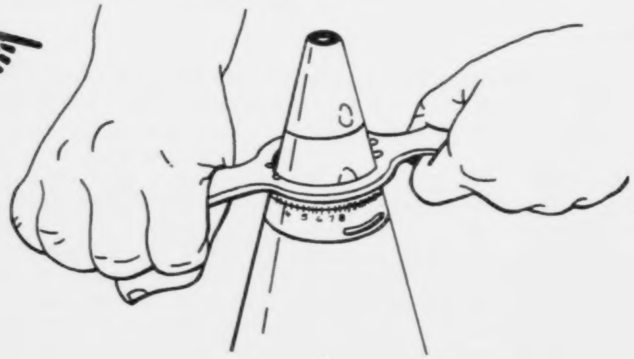

90 SEC ON LOWER CAP SCALE ALINED WITH "O" ON VERNIER SCALE
WHOLE SECOND NUMBERS
70 75 80 85 90 95 100 S 0 5
0 1 3 5 7 9
1969 LOT
TENTHS OF A SECOND NUMBERS

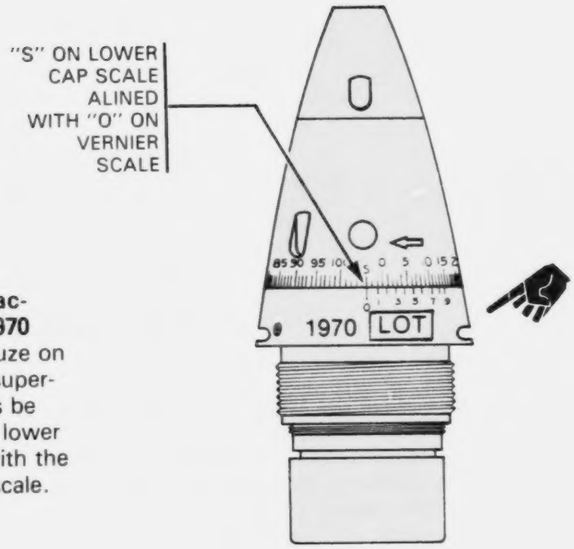

"S" ON LOWER CAP SCALE ALINED WITH "O" ON VERNIER SCALE
LOWER CAP SCALE
VERNIER SCALE
BODY
FUZE M TSQ 564

WARNING
To avoid accidental functioning of PD element in M564 fuze, do not drop, roll, or strike the fuze under any circumstances (packaged, unpackaged, or assembled to the projectile).

(1) **Setting the M564 fuze for superquick (impact) action.** M564 fuzes manufactured before January 1970 must be set on 90 seconds if superquick (impact) action is desired. M564 fuzes manufactured from January 1970 on should be set on "S" for superquick action. The year of manufacture is stamped on the M564 fuze body. These fuzes are shipped with the "S" on the lower cap scale alined with the "O" on the vernier scale.

(a) **M564 fuzes manufactured prior to January 1970.** Use M34 fuze setter to rotate the lower cap in the direction of the arrow (clockwise) from shipping "S" position until the 90-second position on the lower cap scale is alined with the "O" on the vernier scale.



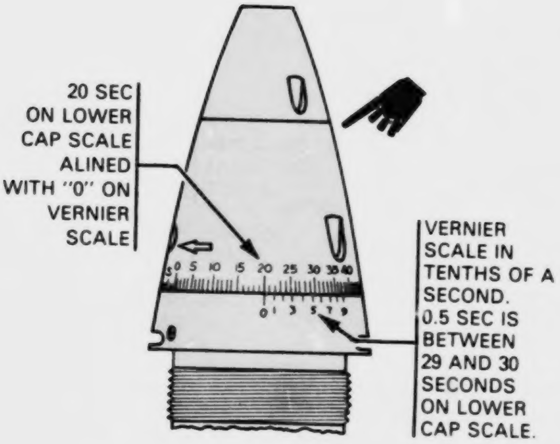

"S" ON LOWER CAP SCALE ALINED WITH "O" ON VERNIER SCALE
85 90 95 100 S 0 5 0 15 2
0 1 3 5 7 9
1970
LOT

(b) **M564 fuzes manufactured in January 1970 and later**. Set the fuze on "S" as shipped for superquick action. Always be sure the "S" on the lower cap scale is alined with the "O" on the vernier scale.

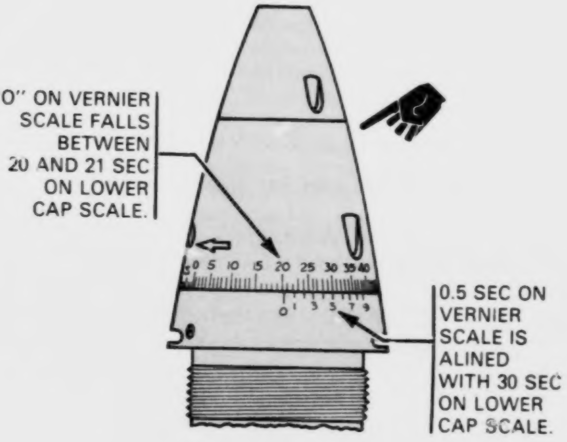
(2) Setting M564 and M565 fuzes for airburst (time).

WARNING

Incorrect settings of MT and MTSQ fuzes can and have resulted in downrange premature malfunctions. The safety of personnel located downrange of a weapon firing MT and MTSQ fuzes (between the weapon and intended target) is in the hands of the gun crew personnel assigned the job of setting the fuzes.

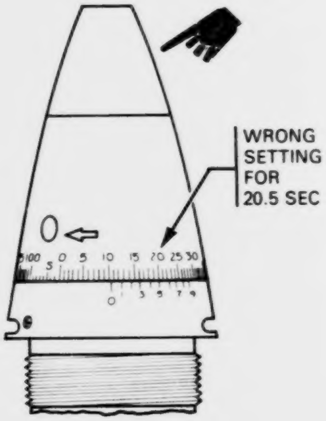

20 SEC ON LOWER CAP SCALE ALINED WITH "0" ON VERNIER SCALE
0 5 10 15 20 25 30 35 40
0 1 3 5 7 9
VERNIER SCALE IN TENTHS OF A SECOND. 0.5 SEC IS BETWEEN 29 AND 30 SECONDS ON LOWER CAP SCALE.

(a) To set the M564 and M565 fuzes for a whole-second time setting, use the M34 fuze setter to rotate the lower cap in the direction of the arrow (clockwise) until the desired whole number of seconds (e.g., 20.0 seconds) on the lower cap scale is alined with the "O" mark engraved on the vernier scale.


"O" ON VERNIER SCALE FALLS BETWEEN 20 AND 21 SEC ON LOWER CAP SCALE.
0 5 10 15 20 25 30 35 40
0 1 3 5 7 9
0.5 SEC ON VERNIER SCALE IS ALINED WITH 30 SEC ON LOWER CAP SCALE.

(b) To set the M564 and M565 fuzes for a tenth of a whole second (e.g., 20.5 seconds), use the M34 fuze setter to set the fuze for the whole seconds on the lower cap scale. (In this case, the whole is 20 seconds.) Next, fin the desired tenth of a second mark on the vernier scale.

Continue to rotate the lower cap in the direction of the arrow (clockwise) until the adjacent upper right graduation on the lower cap scale is alined with the desired tenth of a second mark on the vernier scale.



WRONG
SETTING
FOR
20.5 SEC

NOTE

The fuze setting is always indicated by the position of the "O" on the vernier scale. Each vertical mark on the lower cap scale (moveable portion of fuze) represents one whole second of time. For other than whole-second settings, the "O" on the vernier scale (nonmoveable portion of the fuze) must always be to the right of the whole-second portion of the desired fuze setting and between the whole-second portion of the desired fuze setting and the next one whole-second vertical mark. For example, for a setting of 20.5 seconds, the "O" on the vernier scale is to the right of the 20-second mark and midway between the 20- and 21-second marks on the lower cap scale.

An incorrect fuze setting for 20.5 seconds is shown above. If a fuze is set in this way for 20.5 seconds firing, the fuze is actually set on and will function at 10.5 seconds. This would cause the fuze to function earlier than desired.

NOTE

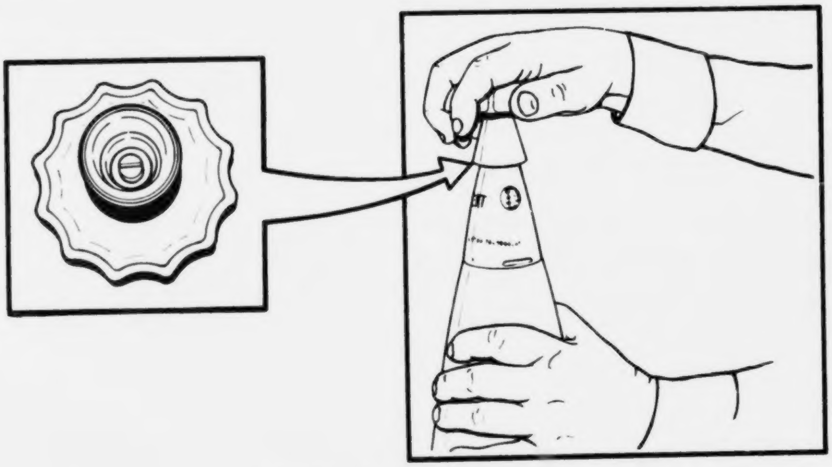
Do not attempt to set the fuze until just before firing.

(3) **Resetting fuze.** If you miss the setting, use the M34 fuze setter and turn the lower cap in the opposite direction (counterclockwise) 2 or 3 seconds below the desired setting. Then rotate the lower cap in the direction of the arrow (clockwise) and set the fuze on the correct time. This can also be done by turning the lower cap in the direction of the arrow (clockwise) all the way around (additional turn) to obtain the desired setting.

(4) **Fuzes not fired.** If prepared for firing but not fired, reset the fuze, using M34 fuze setter, by turning the lower cap in the direction of the arrow (clockwise) until the "S" mark on the fuze lower cap scale is in line with the "O" mark on the vernier scale.

(5) **Fuzes fired in heavy precipitation.** If M564 fuzes are fired in heavy precipitation (heavy rainfall, sleet, snow, or hail), occasional downrange premature functioning may occur. The precipitation necessary to cause malfunctioning is comparable to a heavy downpour which occurs during a summer thundershower. The premature rate will vary with the charge fired and the density of the precipitation.

d. **Procedure Number 4, Fuzes, M577 Series and M582 Series.** The slotted setting key on the nose of the fuze is used for setting the fuze in the following steps.



(1) Press the open end of the M35 fuze setter against the setting key.

(2) Turn the knob handle of the fuze setter counterclockwise, as viewed from the nose end, until the fuze-setter blade engages fuze-setting key slot. The hairline in the window is used for all settings.

NOTE

The M577 series or M582 series fuze is set to the desired time by rotating the fuze setter in a counterclockwise direction. To return to shipping and storage setting, the fuze setter must be rotated in a clockwise direction.

COUNTER-CLOCKWISE **CLOCKWISE**

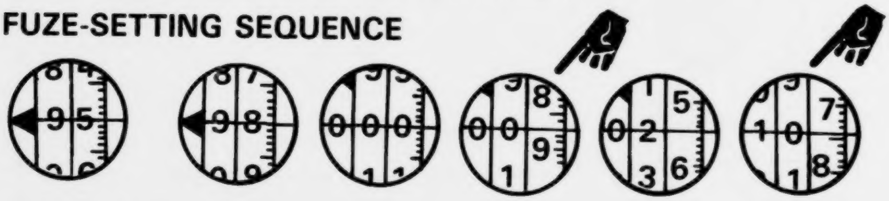
SHIPPING AND STORAGE SETTING (◄93.5 TO ◄95.5)	1/4 TURN
PD SETTING (◄98)	1/4 TURN
000 SECONDS	1/4 TURN
200 SECONDS	20 TURNS

CAUTION

Do not attempt to set these fuzes below ◄ 93.5 when setting them in the clockwise direction or above 200 seconds when setting them in the counterclockwise direction. The settings of 000 and/or 200 are not authorized service settings.

(3) When setting the fuze for PD action (superquick), start with the shipping and storage position (safe) (◄ 93.5 to ◄ 95.5); then turn counterclockwise to ◄ 98.0 for PD action under the hairline window.

FUZE-SETTING SEQUENCE



A STORE (SAFE) B PD C 000.0 D 8.7 E 25.5 F 107.4

(4) To set the fuze for mechanical time action, turn the fuze setter counterclockwise from safe position (◄93.5 to ◄95.5) past PD (◄98.0), until the triangle (◄) moves off the hairline. This action occurs near a 000 setting. Continue to turn the fuze setter counterclockwise until the desired time appears under the hairline. Maintain a very light turning force against the fuze setter while reading the setting. The sequence is illustrated above for settings of 8.7, 25.5, and 107.4.

(5) To set a lower time on a fuze already set, reseat fuze setter and turn clockwise (numbers get smaller) to a setting at least 1 second lower than the required setting (for example, at least 24.5 for 25.5). Reverse direction to counterclockwise (Numbers get larger.), and set required time under the hairline.

(6) To return fuze to the shipping and storage (safe) position, turn the fuze setter clockwise (Numbers get smaller.) until 000 is passed, and continue to turn until setter stops turning freely. This point should be past the PD setting (◄98.0) and between ◄ 95.5 and ◄ 93.5. Notice that the triangle has reappeared in the window. Do not apply excessive force on the fuze setter after it has stopped turning and the setting is between ◄ 95.5 and ◄ 93.5. Return the fuze to the reusable fuze container. The fuze is considered unserviceable after being out of the container for more than 30 days.

(7) Firing temperature limits for M577 series and M582 series MTSQ fuzes are -35°F to +145°F (-37°C to +63°C).

e. Procedure Number 5, Fuze, M501 Series.

WARNING

Exercise extreme care when handling an M501 series fuzed projectile. Mishandling or dropping could cause the fuze to function, expelling the base plate and contents. When handling a projectile assembled with this fuze, exercise extreme care to protect the fuze from impact. Keep pull wire on fuze in place until immediately prior to firing.

CAUTION

Do not use fuzes with cocked or loose lower caps. Mark such fuzes "defective" and return them to the ammunition supply point.

NOTE

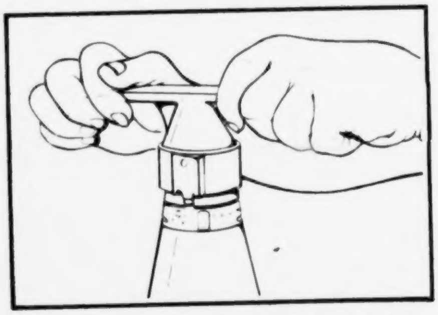
The M501 series fuzes are shipped with the index mark on the lower cap alined with the S engraved on the base.

(1) Time setting.

(a) Check fuzes for cocked or loose lower caps.

(b) To remove safety wire before setting, pull end of wire from hole in lower cap, sliding wire off end of fuze.

(c) With the M27 fuze setter, set fuze by rotating lower cap to desired time in counterclockwise direction or in direction of arrow marked on lower cap. The fuze is properly set when the index mark on the lower cap is alined with desired time, in seconds, engraved on the base.



(d) If the round is not fired after the fuze is set, reset the fuze to the safe (S) position and place the safety wire in its proper position.

(2) Impact setting. Impact functioning of the M501 series MTSQ fuze may be obtained by either leaving the S (shipping mark) alined with the index mark on the base or by setting the graduated time ring so that the time setting is greater than the time of flight. The safety wire must be removed (Pull free end of wire off and out of hole.) before firing or setting the fuze.

4-12. PROPELLING CHARGE PREPARATION

WARNING

Under no circumstances will green bag and white bag charges be assembled together for firing. Critical malfunction could result.

a. **Propelling Charges, M3 Series and M4 Series.** M4A2 and M4A1 white bag charges can be expected to perform within design limits at charges 5 thru 7. However, large dispersions may result when these charges are fired at charges 3 and 4. It is recommended that M3A1 or M3 green bag charges be used instead of white bag charges at charges 3 and 4. If green bag charges are not available, white bag charges may be used, although range dispersions may result.

(1) If required, remove excess increments from charge, and retighten excess strap by twisting and securing ends under straps.

NOTE

Use of the M2 flash reducer to reduce muzzle flash is optional, except when TB 9-1300-385-1 or TB 9-1300-385-2 restricts a specific propelling charge lot to use only with flash reducer. The M4A2 propelling charge has a flash reducer assembled in front of the base charge (increment number 3) at the time of manufacture and does not require use of the M2 flash reducer.

(2) In preparing the M4 or M4A1 white bag charge, one M2 flash reducer should be added in front of each increment used. The charge must be untied and the proper number of M2 flash reducers inserted (i.e., one flash reducer added in front of the base charge and each increment used). The charge is then retied with two interlapping square knots.

b. **Propelling Charges, M119, M119A1, and M119A2**. The M119 and M119A1 are one-increment, charge 8 propelling charges and are shipped ready for firing. After unpacking and inspection, the only preparation required is removal of the igniter protector cap. M119A2 is a one-increment, charge 7 propellant charge, shipped ready for firing. The M119A2 charge 7 is equivalent to M119/M119A1 charge 8 except for small differences in velocity.

c. **Propelling Charge, M203 and M203A1**. The M203 series is a one-increment, charge 8 propelling charge for the M199 cannon. After unpacking and inspection, the only preparation required is removal of the igniter protector cap.

4-13. LOADING AND FIRING

WARNING

Observe all precautions in FM 6-40, particularly limitations regarding overhead fire in training and combat.

Do not fire M110 series WP projectiles which are known to have been stored in other than the base down position. Firing of such projectiles could contribute to inbore explosions or close-in premature malfunctions.

Do not load or fire artillery ammunition without the authorized fuze. Firing of such rounds without fuzes or with unauthorized fuzes could result in in-bore prematures and other hazardous conditions.

Do not load or fire round if the fuze is not fully seated.

Firing of the M557, M572, and M564 fuzes during heavy precipitation (heavy rainfall, sleet, snow, or hail) may result in occasional downrange prematures. The amount of precipitation necessary to cause functioning is comparable to the heavy downpour which occurs during a summer thunderstorm.

Do not fire proximity-fuzed ammunition at targets closer than 750 meters to friendly troops.

Firing the M100 series, M449, M485, or M804 projectiles at charge 2 may occasionally result in stickers.

Do not fire the M483A1, M692, M731, M718/M718A1, M741/M741A1, M825, M687, or M864 projectile below charge 3. Firing below charge 3 may result in stickers.

Do not assemble M3 series green bag charges with M4 series white bag charges. Critical malfunction could result.

Do not fire M549/M549A1 projectiles if obturating band is missing or broken. Separation of the projectile and rocket motor may occur.

a. Make sure the round is clean and the fuze is present and fully seated.

WARNING

Firing a round with an obstruction in the cannon tube can cause an in-bore premature.

b. Make sure there are no obstructions in the cannon tube.

c. Check the firing mechanism to see that the primer expended in previous firing has been removed.

d. Remove grommet from projectile.

WARNING

Never load a propelling charge into the chamber by increments. Only fully assembled charges will be used. Critical malfunction could result.

e. Load fuzed projectile into cannon and ram it solidly into the forcing cone of the cannon tube. Round must remain wedged into the forcing cone at all angles of elevation.

f. Remove the igniter protective cap from the propelling charge and load the propelling charge into the cannon chamber with igniter end (red bag) toward the breechblock assembly.

WARNING

Never close the breechblock assembly unless you can see the red igniter bag on the base of the propelling charge. Misfires, hangfires, erratic performance, or other critical malfunction could result.

g. Close and lock the breechblock assembly.

WARNING

Never insert primer in primer cavity unless breechblock assembly is closed and locked. Ignition of the propelling charge with the breechblock assembly not fully closed presents a critical hazard to the crew.

h. Insert primer and move firing mechanism block assembly to firing position and fire on command of the chief of section.

4-14. AFTER FIRING

a. Make sure the breechblock assembly is secure in the fully open position.

b. Wipe face of obturator spindle assembly after each round and swab the powder chamber, making sure that all burning fragments of powder charge are removed from powder chamber. Look through the cannon tube. If the cannon tube is clear, announce, BORE CLEAR.

c. All ammunition fired must be recorded by charge number, type, and total number of each fired, and entered on DA Form 2408-4.

4-15. AMMUNITION PREPARED FOR FIRING, BUT NOT FIRED

a. Using applicable fuze setter and procedure (table 4-4, p 4-30), reset the fuzes of the projectiles prepared for firing but not fired. Reset time fuzes to safe; reset VT fuzes to initial setting at which they were shipped; reset superquick and delay fuzes to SQ. Replace safety wires in those fuzes so furnished.

b. Disassemble fuze from projectile and repack in original packing. When a long intrusion proximity fuze is removed from the projectile, replace the supplementary charge in the projectile before assembling the spacer and the correct type of lifting plug.

NOTE

Be sure the correct type of lifting plug is used. (For example, energy-absorbing or shock-attenuating lifting plug for M549 series projectiles, yellow fusible or universal lifting plug for M483 series projectiles, and standard eyebolt lifting plugs for other projectiles.)

c. Replace grommet over rotating band.

d. Restore propelling charges to original condition. Make sure all zones (increments) are present, tied, in proper order, in good condition, of the proper lot number, and that igniter caps are replaced.

f. Make sure the lot number of the ammunition corresponds with the lot number on the container.

g. If rocket cap was removed from the M549/M549A1 HERA projectile, replace cap and tighten handtight.

h. Return all projectiles to shaded and protected storage regardless of weather.

i. Special instructions for the M712 projectile are found on page 4-62.

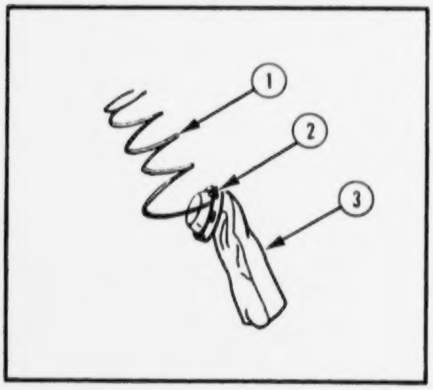
j. Special instructions for the M483A1 and M864 ICM projectile are as follows:

EXPULSION CHARGE ASSEMBLY

INSTALLATION

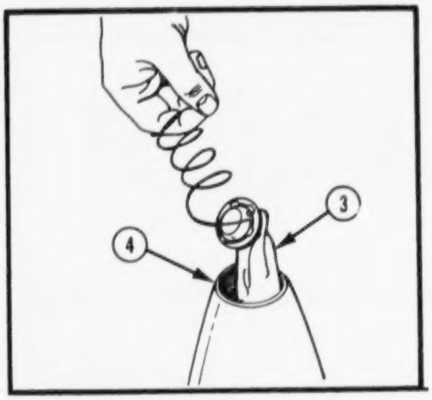
WARNING

Use no other lifting plug except the fusible or universal plug removed from this projectile, because it is designed for safe release of pressure inside the projectile in case of fire during storage or shipping actions.

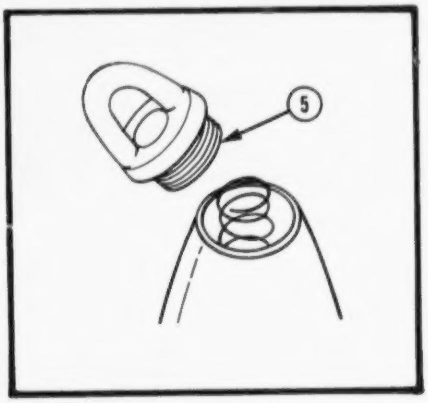


1 Wind the pull-wire (1) under four tabs (2) on the cover of the expulsion charge assembly (3) (1-1/2 turns for proper engagement).

EXPULSION CHARGE ASSEMBLY—Continued



2 Place bagged expulsion charge assembly (3) or cylindrical plastic expulsion charge assembly into projectile fuze well (4).



3 Reinstall fusible or universal lifting plug (5) with gasket.

Section III. MISFIRE AND CHECKFIRE PROCEDURES

4-16. GENERAL PRECAUTIONS

Conditions described below are rarely encountered with a properly maintained weapon and when authorized and properly maintained ammunition is fired. To avoid injury to personnel and damage to equipment, it is important that the nature of these conditions is understood. To determine tube temperature and which action to take, refer to page 2-81 for instructions for using the thermal warning device.

4-17. DEFINITIONS

a. **Checkfire.** A checkfire is a command normally given by the executive officer. In an emergency, the command may be given by anyone who interrupts a fire mission.

b. **Misfire.** A misfire is a failure of a round to fire after initiating action is taken. This may be due to the failure in the functioning of the primer, igniter, propelling charge, or firing mechanism. A misfire in itself is not dangerous; however, it cannot be immediately distinguished from a hangfire. Therefore, misfires must be treated as delayed firings until determined otherwise.

c. **Hangfire.** A hangfire is a delay in the functioning of the primer, igniter, or propelling charge. The delay, though unpredictable, ranges from a fraction of a second to several minutes. A hangfire cannot be distinguished immediately from a misfire.

d. **Sticker.** A sticker is a projectile that is lodged in the tube after being fired. Stickers result from insufficient chamber pressure. Either fire out with charge 5 or higher or notify explosive ordnance disposal (EOD).

NOTE

Stickers may occur when firing Charge 2. When a sticker does occur, hot gasses under pressure are trapped in the chamber. Removal of the primer is dangerous, as it will be shooting rearward when released. The expelled primer may cause injury to personnel standing in its path or ricochet.

WARNING

Do not stand behind breech when removing the primer. Do not grasp the firing mechanism block assembly so that your hand is exposed to being hit by the expelled primer.

If a sticker round is encountered, follow the procedures for unloading a sticker round (p. 2-94.3).

e. **Cookoff.** The functioning of the propelling charge or projectile when initiated by the heat of the weapon.

f. **Hot Weapon.** A hot weapon is one in which the tube and breech have been brought to a sufficiently high temperature by previous firings so that they can transmit, in several minutes time, enough heat to the round to activate its explosive components.

g. **Hot Weather.** Hot weather is any weather in which the outside temperature is expected to exceed +100°F (+38°C) during the day.

4-18. MISFIRE AND CHECKFIRE PREVENTIVE OR CORRECTIVE PROCEDURES

WARNING

In the event of a failure to fire, keep the weapon trained on the target. When firing is interrupted, promptly remove the projectile from the chamber if time allows as indicated by the thermal warning device (p 2-81).

a. **General.** Misfires and checkfires are not dangerous in themselves; however, two conditions hazardous to crew and equipment can develop if the proper corrective procedures are not followed.

(1) In case of a checkfire or a misfire, the weapon may unexpectedly fire. All personnel should stay clear of the recoiling parts and muzzle. The weapon should be kept trained on the target until the projectile has been removed from the weapon.

(2) If a charge or projectile is chambered in a hot tube following any failure to fire, the possibility of a cookoff exists.

b. **Misfire and Checkfire Procedures.**

(1) Failure to fire with a cold tube (green range on TWD). When indicator is in the green zone (below +170°F (+77°C)), there are no restrictions with respect to misfire instructions, and normal cold tube misfire procedures apply (p 4-42). In this region, there is little danger of cookoff.

(2) Failure to fire with a warm tube (yellow range on TWD). The warm tube has two upper boundaries. When there is failure to fire, use +350°F (+177°C) as the upper boundary. (In hot weather use +300°F (+149°C).) For misfires occurring when the indicator is in the yellow zone, follow procedures on page 4-43. (In hot weather follow procedures on p 4-44.)

(3) Failure to fire with a hot tube (red range on TWD). If the indicator reaches the red zone, the weapon should be used in combat emergency only. There is an immediate danger of cookoff if a misfire occurs. Follow procedures on page 4-44.1.

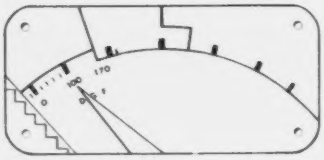
c. **Inspection of Primer After Removal.** After a primer has been removed, it should be inspected to determine whether the primer or the firing mechanism caused the misfire. If the primer has been dented and not fired, the primer is at fault. If the primer has not been dented, the firing mechanism is at fault. If the firing mechanism caused the misfire, refer to the troubleshooting table (p 3-17).

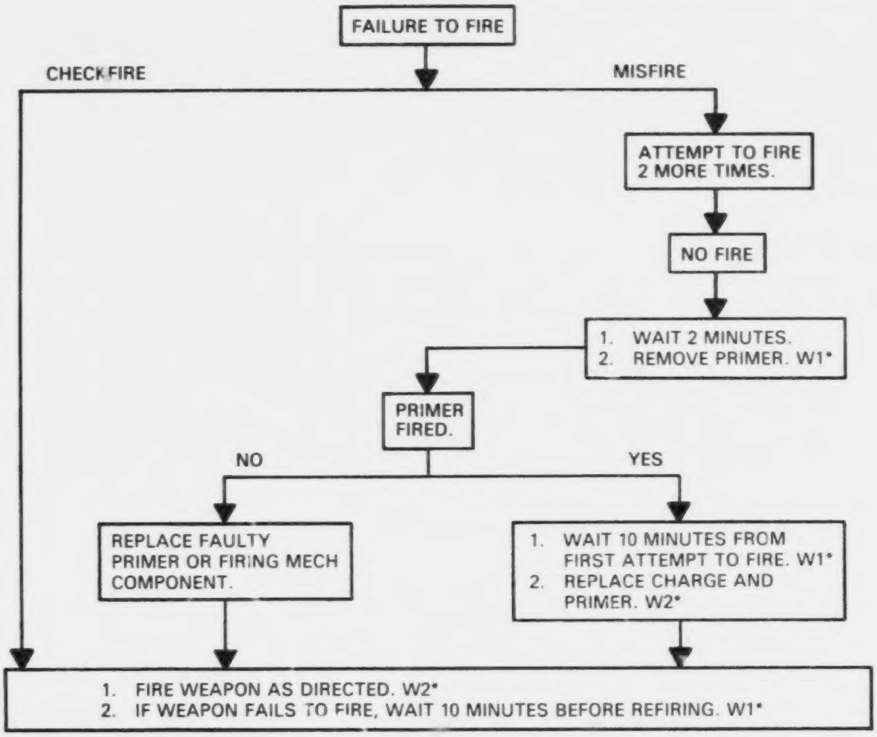
WARNING

Projectiles and fuzes that have been rammed and then removed from the tube must not be re-used. Unloading may have created some nonstandard conditions. They must be turned over to authorized personnel for destruction or demilitarization. Only an M712 Copperhead projectile that has been rammed and extracted from a cold tube may be re-used.

d. **Notification of EOD Personnel.** If a projectile cannot be cleared from the weapon within the specified time, EOD personnel must be notified to remove the stuck projectile.

MISFIRE PROCEDURES FOR COLD TUBE (TWD GREEN READING 0° TO +170°F (-17° TO +77°C))




FAILURE TO FIRE
CHECKFIRE
MISFIRE
ATTEMPT TO FIRE 2 MORE TIMES.
NO FIRE
1. WAIT 2 MINUTES.
2. REMOVE PRIMER. W1*
PRIMER FIRED.
NO
YES
REPLACE FAULTY PRIMER OR FIRING MECH COMPONENT.
1. WAIT 10 MINUTES FROM FIRST ATTEMPT TO FIRE. W1*
2. REPLACE CHARGE AND PRIMER. W2*
1. FIRE WEAPON AS DIRECTED. W2*
2. IF WEAPON FAILS TO FIRE, WAIT 10 MINUTES BEFORE REFIRING. W1*

WARNING

W1-HANGFIRE POSSIBLE; STAND CLEAR OF RECOILING PARTS.
W2-DO NOT FIRE UNLOADED PRIMER, CHARGE, OR PROJECTILE. SEPARATE, MARK UNSERVICEABLE.

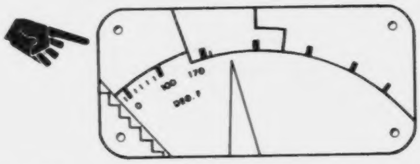
NOTE

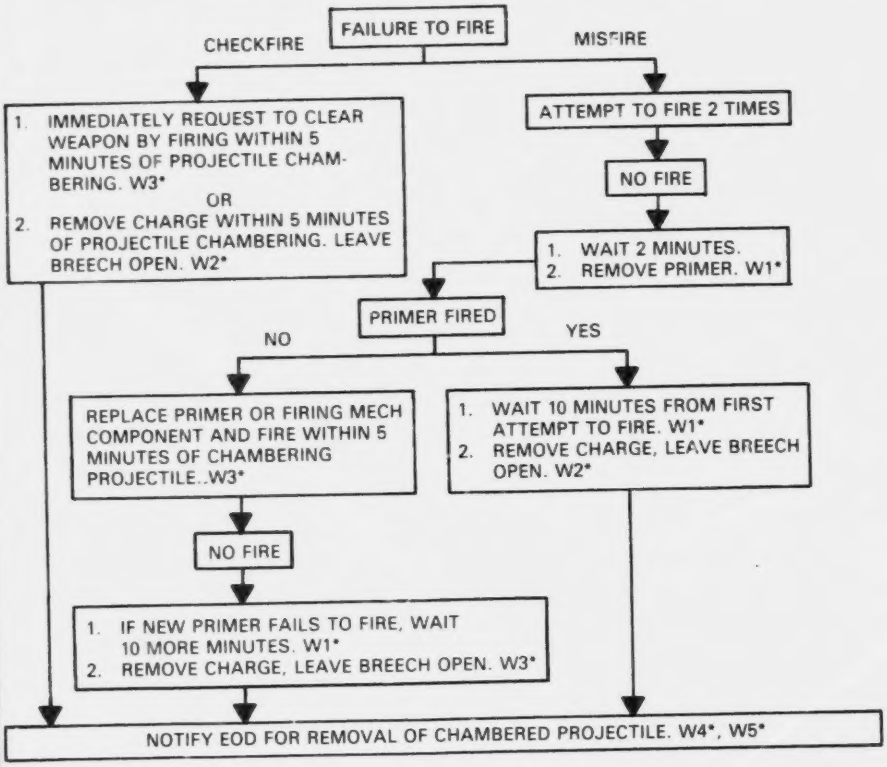
SEE PAGE 2-96 FOR USE OF BELL RAMMER.

MISFIRE PROCEDURES FOR WARM TUBE (TWD YELLOW READING +170° TO +350°F (+77° TO +177° C)) WG*

CAUTION

ONLY 5 MINUTES AVAILABLE FOR CORRECTIVE ACTION AFTER CHAMBERING.
USE SPECIAL WARM TUBE MISFIRE PROCEDURES IN HOT WEATHER, PAGE 4-44.





FAILURE TO FIRE

1. IMMEDIATELY REQUEST TO CLEAR WEAPON BY FIRING WITHIN 5 MINUTES OF PROJECTILE CHAMBERING. W3*

OR

2. REMOVE CHARGE WITHIN 5 MINUTES OF PROJECTILE CHAMBERING. LEAVE BREECH OPEN. W2*

ATTEMPT TO FIRE 2 TIMES

NO FIRE

1. WAIT 2 MINUTES.
2. REMOVE PRIMER. W1*

PRIMER FIRED

REPLACE PRIMER OR FIRING MECH COMPONENT AND FIRE WITHIN 5 MINUTES OF CHAMBERING PROJECTILE..W3*

1. WAIT 10 MINUTES FROM FIRST ATTEMPT TO FIRE. W1*
2. REMOVE CHARGE, LEAVE BREECH OPEN. W2*

NO FIRE

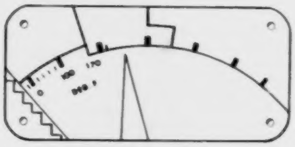
1. IF NEW PRIMER FAILS TO FIRE, WAIT 10 MORE MINUTES. W1*
2. REMOVE CHARGE, LEAVE BREECH OPEN. W3*

NOTIFY EOD FOR REMOVAL OF CHAMBERED PROJECTILE. W4*, W5*

WARNING

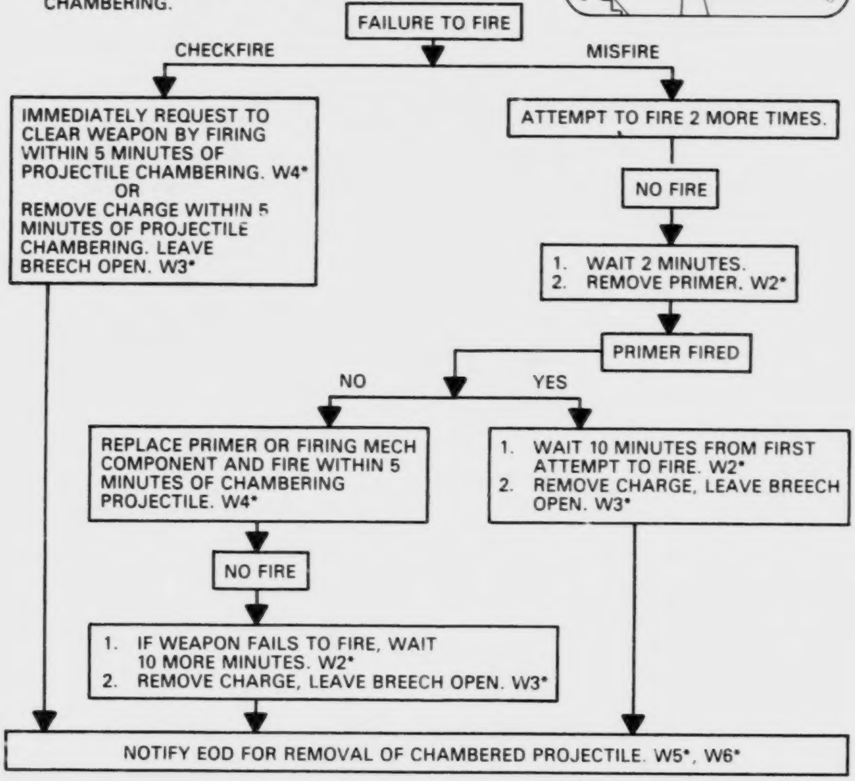
W1-HANGFIRE POSSIBLE; STAND CLEAR OF RECOILING PARTS.
W2-DO NOT FIRE DOWNLOADED AMMUNITION. SEPARATE, MARK UNSERVICEABLE.
W3-A HEATED PROJECTILE MAY CAUSE AN INBORE EXPLOSION IF FIRED AFTER 5 MINUTES.
W4-WAIT UNTIL TWD FALLS BELOW +160°F (+71°C) BEFORE PERMITTING EOD TO REMOVE PROJECTILE.
W5-NEVER FIRE A PROJECTILE OR CHARGE THAT HAS BEEN ALLOWED TO COOL IN A HEATED TUBE. SEPARATE, MARK UNSERVICEABLE.
W6-WEATHER IS CONSIDERED HOT IF OUTSIDE TEMPERATURE IS EXPECTED TO REACH +100°F (+38°C) DURING THE DAY.

SPECIAL MISFIRE PROCEDURES FOR WARM TUBE IN HOT WEATHER (TWD YELLOW READING +170° TO +300°F (+77° TO +149°C)) W1*, W7*



CAUTION

ONLY 5 MINUTES AVAILABLE FOR CORRECTIVE ACTION AFTER CHAMBERING.



FAILURE TO FIRE

IMMEDIATELY REQUEST TO CLEAR WEAPON BY FIRING WITHIN 5 MINUTES OF PROJECTILE CHAMBERING. W4*
OR
REMOVE CHARGE WITHIN 5 MINUTES OF PROJECTILE CHAMBERING. LEAVE BREECH OPEN. W3*

ATTEMPT TO FIRE 2 MORE TIMES.

NO FIRE

1. WAIT 2 MINUTES.
2. REMOVE PRIMER. W2*

PRIMER FIRED

REPLACE PRIMER OR FIRING MECH COMPONENT AND FIRE WITHIN 5 MINUTES OF CHAMBERING PROJECTILE. W4*

1. WAIT 10 MINUTES FROM FIRST ATTEMPT TO FIRE. W2*
2. REMOVE CHARGE, LEAVE BREECH OPEN. W3*

NO FIRE

1. IF WEAPON FAILS TO FIRE, WAIT 10 MORE MINUTES. W2*
2. REMOVE CHARGE, LEAVE BREECH OPEN. W3*

NOTIFY EOD FOR REMOVAL OF CHAMBERED PROJECTILE. W5*, W6*

WARNING

W1-IF PROJECTILES ARE NOT PROPERLY SHADED, TREAT A WARM TUBE AS A HOT TUBE.

W2-HANGFIRE POSSIBLE; STAND CLEAR OF RECOILING PARTS.

W3-DO NOT FIRE UNLOADED AMMUNITION. SEPARATE, MARK UNSERVICEABLE.

W4-A HEATED PROJECTILE MAY CAUSE AN INBORE EXPLOSION IF FIRED AFTER 5 MINUTES.

W5-WAIT UNTIL TWD FALLS BELOW +160°F (+71°C) BEFORE PERMITTING EOD TO REMOVE PROJECTILE.

W6-NEVER FIRE A PROJECTILE OR CHARGE THAT HAS BEEN ALLOWED TO COOL IN A HEATED TUBE. SEPARATE, MARK UNSERVICEABLE.

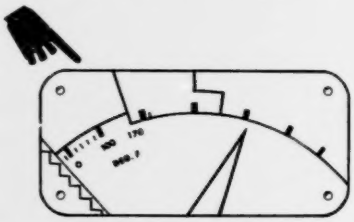
W7-WEATHER IS CONSIDERED HOT IF OUTSIDE TEMPERATURE IS EXPECTED TO REACH +100°F (+38°C) DURING THE DAY.

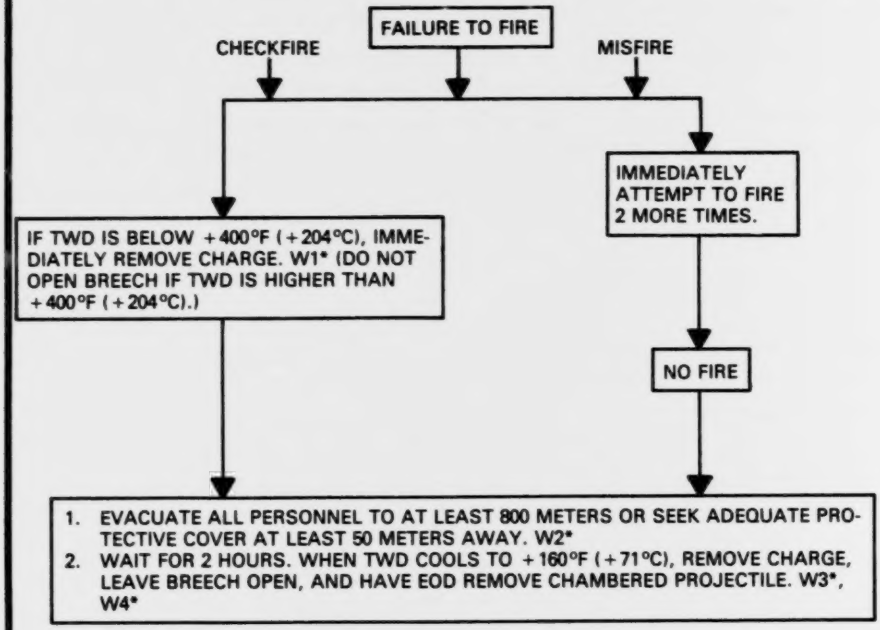
MISFIRE PROCEDURES FOR HOT TUBE (TWD RED READING ABOVE + 350 °F (+ 177 °C) OR TWD RED READING ABOVE + 300 °F (+ 149 °C) IN HOT WEATHER) W5*

WARNING

DO NOT FIRE IN A HOT TUBE EXCEPT IN A COMBAT SITUATION.

DO NOT TAKE CORRECTIVE ACTION EXCEPT AS STATED BELOW.





FAILURE TO FIRE

CHECKFIRE

MISFIRE

IMMEDIATELY ATTEMPT TO FIRE 2 MORE TIMES.

IF TWD IS BELOW +400°F (+204°C), IMMEDIATELY REMOVE CHARGE. W1* (DO NOT OPEN BREECH IF TWD IS HIGHER THAN +400°F (+204°C).)

NO FIRE

1. EVACUATE ALL PERSONNEL TO AT LEAST 800 METERS OR SEEK ADEQUATE PROTECTIVE COVER AT LEAST 50 METERS AWAY. W2*
2. WAIT FOR 2 HOURS. WHEN TWD COOLS TO +160°F (+71°C), REMOVE CHARGE, LEAVE BREECH OPEN, AND HAVE EOD REMOVE CHAMBERED PROJECTILE. W3*, W4*

WARNING

W1-CHARGE COOKOFF POSSIBLE AFTER 1 MINUTE.

W2-DO NOT TAKE COVER IMMEDIATELY TO REAR OF WEAPON.

W3-DO NOT FIRE UNLOADED PRIMER AND CHARGE. SEPARATE, MARK UNSERVICEABLE.

W4-NEVER FIRE A PROJECTILE OR PRIMER CHARGE THAT HAS BEEN ALLOWED TO COOL IN A HEATED TUBE. SEPARATE, MARK UNSERVICEABLE.

W5-WEATHER IS CONSIDERED HOT IF OUTSIDE TEMPERATURE IS EXPECTED TO REACH +100°F (+38°C) DURING THE DAY.

Section IV. MAINTENANCE

4-19. HANDLING

WARNING

Keep fire and flammable materials out of the ammunition area. There will be no smoking in the vicinity of ammunition.

Shield all ammunition from high temperatures (e.g., direct rays of the sun). When the outside temperature is expected to reach +100°F (+38°C), failure to shade the projectiles could result in damage to materiel and loss of life.

a. Do not expose ammunition and components containing explosives to extreme temperatures. Do not expose to direct sunlight, flame, or other sources of heat.

b. Do not expose unpacked propelling charges and fuzes to rain, excessive humidity, or ground moisture.

c. Prevent rough handling of projectiles and fuzes. Do not strike projectiles together and do not offload ammunition by dropping projectile on top of projectile.

d. Protect fuzes, primers, and flash reducers at all times from foreign matter and impact. A drop of 4 feet (1.20 m) may cause the electrolyte vial in a VT fuze battery to break, thus causing a dud.

e. Do not disassemble fuzes.

4-20. CARE

a. Ammunition is packed to withstand conditions ordinarily encountered in the field. Keep packing boxes from becoming broken or damaged.

b. Since ammunition is impaired by moisture, frost, extreme temperatures, and foreign matter (mud, oil, etc), observe the following:

(1) Do not break the moisture-resistant seal on the container until ammunition is to be used.

(2) Shield all ammunition from high temperatures (e.g., the direct rays of the sun). When covering projectiles to provide this shield, cover with a tarpaulin. Ensure 18 in. (45 cm) of air space over and 6 in. (15 cm) of air space on the sides to allow free air flow necessary to keep projectiles cooler in hot weather.

4-21. MAINTENANCE

WARNING

Alteration of loaded ammunition or components is prohibited. Unauthorized modification of ammunition could cause critical malfunction.

NOTE

Proper performance of ammunition maintenance procedures when ammunition is received by using units assures that ammunition on hand is kept ready for use.

a. **General.**

(1) Inspect ammunition packaging daily. Open boxes or containers which show evidence of contamination or deterioration and inspect ammunition. Do not open sealed boxes or containers unless defective ammunition is suspected.

NOTE

Procedures for preparing the M712 projectile (Copperhead) for firing begin on page 4-50, as well as the care, maintenance, inspection, unpackaging, and repackaging of this projectile.

(2) Inspect unpackaged ammunition and explosive components daily.

(3) Wipe off wet or dirty ammunition at once. Remove light corrosion. Do not polish ammunition to make it look better.

(4) Consider ammunition unserviceable if it has severe rust or propellant contamination, particularly moisture. Do not use except in an emergency.

(5) When repackaging ammunition, put it back into the original containers. If other packing material must be used, the old markings should be transferred to the new containers.

b. **Projectiles.**

(1) Visually inspect projectiles for the following defects:

(a) Distorted, out of round, or damaged body.

(b) Dirt or other foreign material.

(c) Seepage of explosive filler.

(d) Rust through projectile baseplate.

(2) Clean dirt or foreign material from projectile by wiping with a damp rag (item 13, app D).

(3) Return defective projectiles to ammunition supply point.

(4) Inspect the M549/M549A1 projectile for the following:

(a) Missing or broken obturating bands. The projectile cannot be used if the obturating band is broken or missing. Return projectile to the supply point.

(b) Broken energy-absorbing lifting plugs. When the lifting plug is broken, the threaded area will remain in the projectile. Do not attempt to extract any portion of the broken plug. Return the projectile to the supply point.

(5) The M483A1 projectile can be used if the obturating band is missing or broken. Remove and discard broken obturating bands.

c. **Propelling Charge, M3 and M4 Series.**

(1) Visually inspect propelling charges for the following defects:

(a) Loose tie straps, allowing separation of the charge into increments.

(b) Missing increment, extra increment, or incorrect sequencing (order) of increments.

(c) Increment bags torn or damaged to the extent that black powder or propellant spills out.

(d) Wet propelling charge.

(e) Missing or damaged red igniter pad on base of charge.

(2) Charges requiring retying may be retied as follows:

(a) Assemble increments in correct order.

(b) Tie the four tie straps over top of charge.

(3) Return all defective charges to the ammunition supply point.

d. Propelling Charges M119, M119A1, M119A2, M203, and M203A1.

(1) Visually inspect propelling charges M119, M119A1, M119A2, M203, and M203A1 for the following defects:

NOTE

Flash reducer is sewn into sides of charge bag on M119A2 charge.

(a) Missing flash reducer.

(b) Charge bag ripped or damaged to the extent that propellant can escape.

(c) Black powder leaking from base igniter pad.

(d) Base igniter pad not centered with respect to outer diameter of charge.

(e) Evidence of broken or damaged central igniter tube (M119, M119A1, and M203 only).

(f) Tie straps not tight over forward end of charge.

(g) Lacing jacket not secure on charge (M119, M119A1, and M203 only).

(h) Cord missing or broken on lacing jacket (M119, M119A1, and M203 only).

(i) M203A1 charges with crushed or distorted cases or with missing or broken propellant are not to be fired.

(2) If tie straps are loose, retighten the straps at the forward end of the charge.

(3) Return all defective charges to the ammunition supply point.

e. Fuzes.

(1) Inspect fuzes for the following defects:

(a) Damage to body or threads.

(b) Loose components.

(2) Return defective fuzes to ammunition supply point.

f. Ammunition or Components of Ammunition Prepared for Firing, but Not Rammed.

(1) Return such ammunition to the original condition and packing. Mark appropriately, and use first in subsequent firings to keep stocks of open packings to a minimum.

(2) Reassemble the supplementary charge and the correct type of lifting plug (with gasket and spacer) to the projectile to restore it to its original condition. Return fuzes to original condition. Return fuzes to original packing. In reassembling the components, make certain the supplementary charge is properly inserted (felt pad end innermost).

(3) Remove the projectile spotting charge from the M577 series fuze and replace the expulsion charge assembly and fusible or universal lifting plug with gasket to the M483A1 or M864 projectiles. Replace rocket cap in M549 and M549A1 projectiles.

(4) Reassemble propelling charges prepared for firing and not used. Replace in original containers as follows:

(a) If increment was removed, reinstall and retie.

(b) Replace igniter protective cap.

(c) Repack charge in container (igniter end first), and close and secure container.

(d) Mark container appropriately, and use charge first in subsequent firings.

g. Unserviceable Ammunition.

(1) Conspicuously mark unserviceable ammunition or explosive components UNSERVICEABLE and return to ammunition supply personnel for disposition.

(2) Repackage ammunition in original containers. If original container is unsuitable, use available material and transfer all markings. All layers of packing must be conspicuously marked UNSERVICEABLE.

h. Excess Explosive Components.

(1) Pack supplementary charges removed from projectiles prior to assembling long intrusion proximity fuzes in containers from which proximity fuzes were removed.

(2) Properly mark container and return it to ammunition supply personnel for disposition.

(3) Destroy any unused powder increments or expelling charges left over after round has been fired by burning them in a safe place.

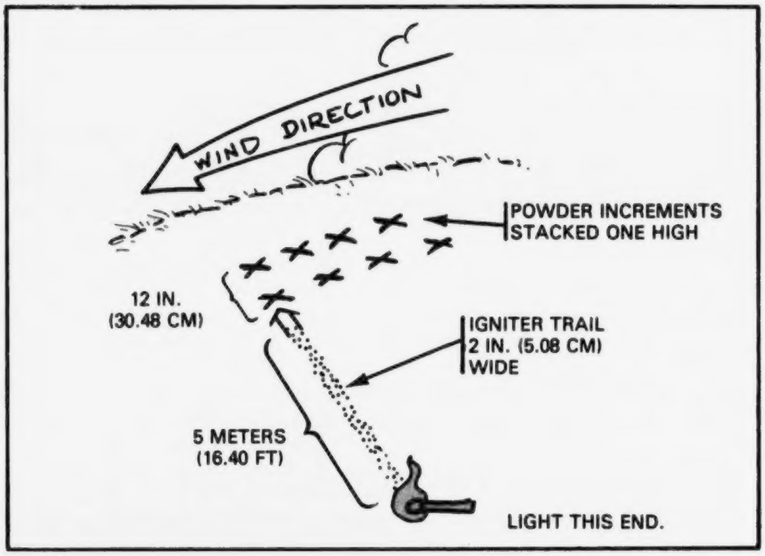
i. Destroying Powder Increments.

(1) Locate proper burning area. Area should be 50 meters (164.04 ft) from any combustible material.

(2) Ensure proper firefighting equipment and personnel are present.

(3) Lay out powder increments parallel to wind direction in 12-in. (30.48-cm) wide column.

(4) Lay out an igniter trail at the downwind end of the line of increments by opening one powder bag and making a trail of powder at 90 degrees to the powder increments. The igniter trail should be approximately 5 meters (16.40 ft) long and 2 in. (5.08 cm) wide. See diagram below.


WIND DIRECTION
POWDER INCREMENTS STACKED ONE HIGH
12 IN. (30.48 CM)
IGNITER TRAIL 2 IN. (5.08 CM) WIDE
5 METERS (16.40 FT)
LIGHT THIS END.

(5) Light the end of the igniter trail, then move away from the powder increments.

(6) While powder is burning, be alert for sparks or burning fragments caught by the wind.

(7) When powder is through burning, be sure all flames are extinguished and no smouldering ashes remain. BE SURE ASHES ARE COMPLETELY BURNED.

4-22. STORAGE

WARNING
Ammunition exposed directly to sunlight, or in unventilated containers, enclosures, shelters, freight cars, closed vehicles, and similar structures exposed to direct sunlight may reach temperatures exceeding upper storage limits. Avoid exposure of ammunition components to direct sunlight. Do not store ammunition assembled with tetrytol-loaded bursters (i.e., projectiles, 155-mm: smoke, WP, M110; gas, H and HD, persistent, M110) at temperatures exceeding +125° F (+52° C).

a. **Temperatures Limits.**

(1) Except as otherwise specified, observe the following limits:

(a) Lower limit is −80° F (−62° C) for period of not more than 3 days.

(b) Upper limit is +160° F (+71° C) for periods of not more than 4 hours per day.

WARNING
Do not fire WP projectiles which are known to have been stored in other than base down position. Firing of such projectiles could contribute to inbore explosions or close-in premature malfunctions.

(2) Store or transport projectiles containing WP at a temperature below the melting point of the WP filler (+111.4° F (+44° C)). If this is not practicable, store or transport such projectiles on their bases so that, should the WP filler melt, it will resolidify with the void in the nose of the projectile.

(3) Protect proximity fuzes and proximity rounds from long exposure in high humidity. Store M728 and M732 fuzes in temperatures between −65° F (−54° C) to +145° F (+63° C).

WARNING
Do not store ammunition under trees or near tall buildings that attract lightning. When ammunition must be stored in the open, select a storage site free of power lines, electric cables, and flammable materials. Sites should not be adjacent to reservoirs, water mains, etc. Do not store ammunition near a large concentration of personnel.

b. **Sites.** Store ammunition in the firing area so that it is protected against accidental explosions. Sites should be level and well drained.

c. **Provisions.**

NOTE
A hardstand of blacktop or gravel and sand is preferable to excessive use of dunnage.

(1) Use heavy, well supported dunnage to keep bottom tier of stack off the ground and to prevent it from sinking into the ground.

(2) Allow at least 6 inches (15.24 cm) of space beneath the pile for air circulation. Dig trenches to prevent water from flowing under pile.

(3) Provide nonflammable covers (e.g., tarpaulin) for all ammunition. Maintain air space of approximately 18 inches (45.72 cm) between cover and ammunition. Keep cover at least 6 inches (15.24 cm) from pile on ends and sides for air circulation.

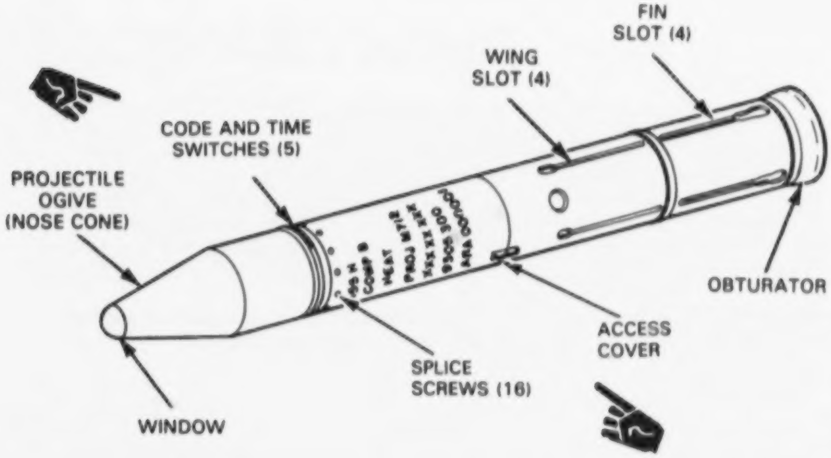
(4) Store M110 series and WP projectile rounds nose up; this does not apply to the M825 WP projectile.

(5) Store ammunition and primer containers with the top side up. Labels or markings on boxes and containers indicate which side should be up.

SECTION V. M712 HEAT, CANNON-LAUNCHED, GUIDED PROJECTILE AND M823 TRAINING PROJECTILE (COPPERHEAD)

4-23. DESCRIPTION

a. M712 cannon-launched, guided projectile is a terminally guided system launched from the M198 howitzer into a ballistic trajectory. During flight, the target is illuminated by a laser beam from a laser designator. An onboard computer continuously refines the terminal trajectory and provides guidance to the control surfaces, causing the round to home in on stationary or moving hard-point targets. The M712 projectile is fired in the same manner as conventional projectiles.



WARNING

The M823 training projectile must not be fired. Such firing could be a hazard to personnel forward of the weapon.

b. The training round for M712 projectile is M823 projectile. The M823 projectile is designed to train 155-mm howitzer weapon crews in the handling and setting of the M712 projectile. It simulates the M712 in weight, center of gravity, and external appearance. It contains code and time switches which are set to simulate prefiring activity by the crew; however, it does not have the wings or fins. It is shipped and stored in the same container as the M712 projectile and color coded for easy identification. The containers for both the M712 and M823 projectiles are forest green. Marking for the M712 is yellow; for the M823 it is white. Bronze patches at container ends also identify the M823 projectile inside.

4-24. UNPACKAGING AND INSPECTION

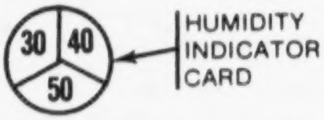
WARNING

If exuded composition B is observed on the projectile or in the container during the unpackaging and inspection operations, move the projectile to a safe area and notify EOD for disposal.

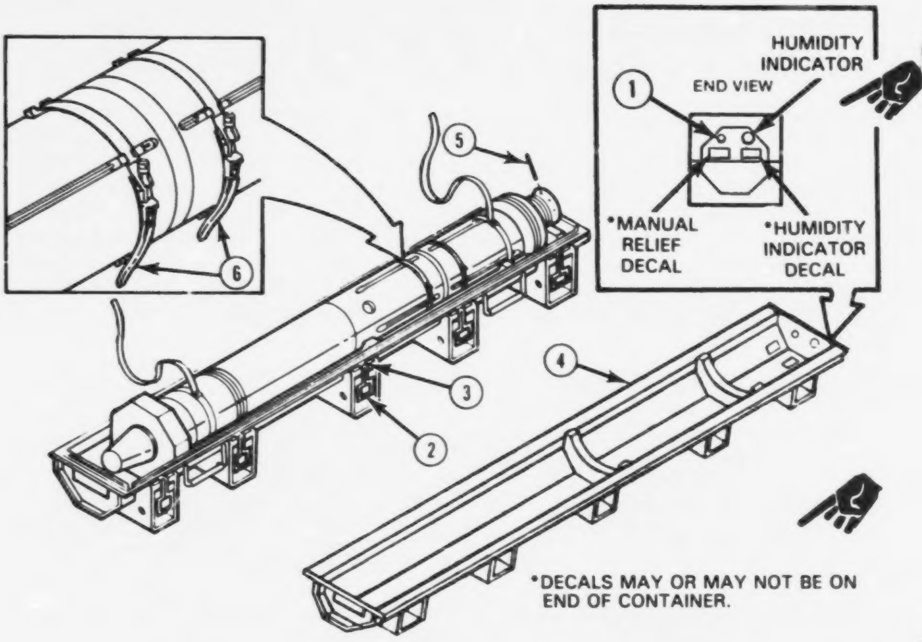
NOTE

Unless the unpackaged M712 projectile is to be fired immediately, it must be protected from the elements (by means of protective bag) as described below. Do not let an unpackaged M712 projectile sit out unprotected.

a. **Unpackaging.** A humidity indicator is located in the aft end of the container. The indicator card is the pie-sector type (the M823 training round has a card that resembles the card for the M712 projectile, but "DUMMY CARD" is printed on its face. These procedures apply only to the M712 projectile).



Open only those containers whose humidity indicator card shows under 40 percent relative humidity (40 percent sector must be colored blue, 30 percent sector may be blue or pink), and only when a fire mission is planned or anticipated. If the 40 percent humidity section is pink, turn complete item in to battalion ammunition section. Keep all packaging materials in the container. A protective bag is provided inside each container. When mission requirements dictate a need, the M712 projectile may be removed from the shipping and storage container and placed in the protective bag. The protective bag will protect the round against direct effects of water, sunlight, dirt, and debris. However, it will not protect the round from the elements for more than 30 days at a time. Repackage unfired projectiles within 30 days and turn in to battalion ammunition section. Projectiles must be repackaged for vehicular transportation. Unpackage the M712 projectile from its container as follows:



*DECALS MAY OR MAY NOT BE ON END OF CONTAINER.

CAUTION

Before unpackaging round from container, make a quick visual inspection of the projectile for obvious damage or other conditions that would prevent use. If projectile appears unuseable, replace container cover, close latches, and return to battalion maintenance.

(1) Using a screwdriver or equivalent tool, break and remove metallic seal wires (if present) located on center latch on both sides of container.

(2) Depress manual relief valve (1).

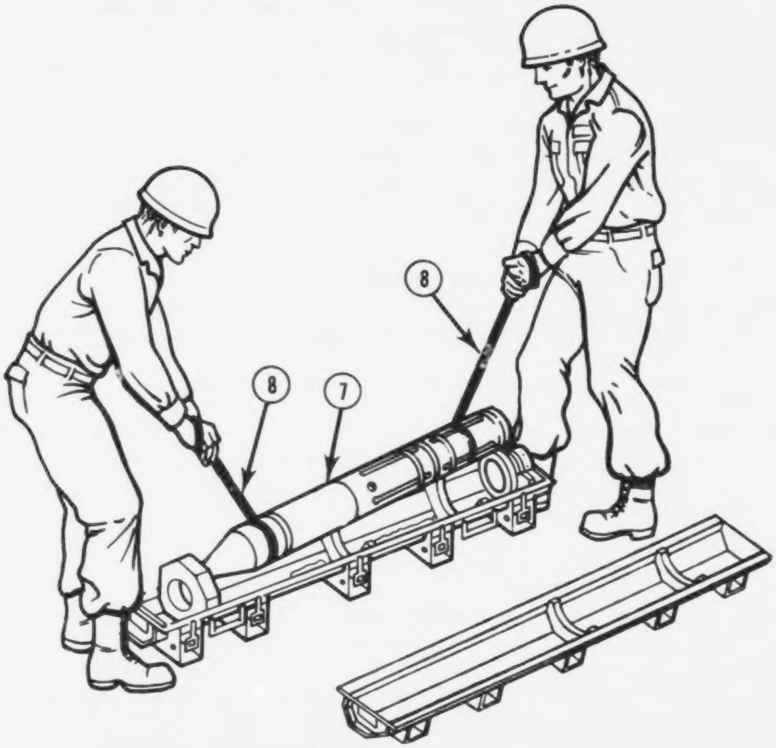
(3) Release container latches (2), starting at the manual relief valve (aft) end, in pairs. Pull latch handles all the way up, remove barrel nut (T-bolt) (3) from recess in cover, and then push down all the way.

(4) Separate cover (4) from container body and place upside down on ground alongside the body.

(5) Partially pull torquing rod (5) from rear end of tension mechanism.

(6) Turn torquing rod counterclockwise to release tension, then spin tension mechanism by hand until it stops.

(7) Open stainless steel fin and wing preload bands (6), remove and place in container.



CAUTION

Do not let the projectile touch the ground or lay in water. Projectile may be placed on a tarpaulin or may be put down across the top of the open container. Water, dirt, or other materials entering projectile through wing/fin slots may cause projectile to fail during flight. Do not touch or grasp ogive when handling and loading projectile.

(8) Carefully remove projectile (7) from container by lifting it up and to the rear, using lifting straps (8) provided on the projectile.

(9) Place the projectile on a clean, dry surface. The projectile should be shielded from direct sunlight, rain, dirt, and other debris.

(10) Remove lifting straps (8), and place them in the container.

(11) Keep the container and all packing materials for reuse or return complete container to battalion ammunition section.

b. **Inspection of M712 Projectile.** Perform the following inspections immediately after the projectile is unpackaged from its container. If a projectile is found to be unserviceable as a result of damage or other defects as described below, repackage the projectile in its original container, and return to battalion ammunition section. Attach a tag describing the defects.

(1) Inspect the window area of the nose cone to make sure that it is clean and that there are no cracks, fogging, indications of moisture on the inside of the window, or other damage. Clean a dirty window, using a clean wiping rag (item 13, app D). Reject a projectile as unserviceable for any of the following reasons:

(a) Window cannot be properly cleaned.

(b) Window shows signs of fogging or has moisture on the inside.

(c) Window is cracked, broken, or badly gouged.

(2) Inspect code and time switches to make sure that they are free of dirt and that all numbers and index marks are legible. Remove dirt, using a clean wiping rag (item 13, app D). Reject a projectile as unserviceable for any of the following reasons:

(a) Missing or broken switch dials.

(b) Switch dials cannot be properly cleaned to make numbers and index marks legible.

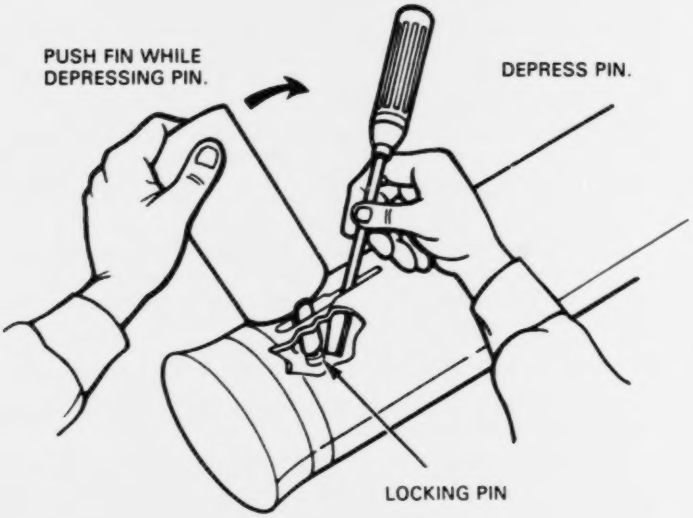
(c) Switches cannot be rotated freely when the firing codes are being set into the projectile. Turn switches, using a screwdriver or the tang end of the M18 fuze-setter wrench, to check switches turn. A click should occur at each number.

(3) Reject a protectile as unserviceable if the obturator has a crack or large gouge.

(4) Inspect fins to make sure that they are not in extended position. If they are, perform either (a) or (b) below to relatch fins. Reject projectile as unserviceable if fins cannot be relatched.

(a) If fin is only part way out, gently push fin back into its slot until it locks in place.

(b) If fin is locked in extended position, insert a small screwdriver, knife blade, or similar tool to fin slot as shown. Depress locking pin with tool, and push fin forward at the same time to lock fin in retracted position.



(5) Inspect the overall projectile to make sure that there is no caked-on dirt, excessive corrosion, loose or missing items such as screws or access covers or other damage. Remove dirt, minor corrosion, and foreign matter using a clean, soft cloth (item 13, app D) or tissue. Inspect for loose or missing screws (see illustration in paragraph 4-23.a., page 4-50). If any splice screw or access cover screw is loose, attempt to make it fingertight, turning by hand. Reject a projectile as unserviceable if there is excessive corrosion or screws missing on access cover. Minor corrosion, minor gouges, burrs on metal projectile body, and/or missing splice screws are acceptable. Screws slightly above flush are acceptable after tightening.

c. **Inspection of M823 Projectile.** Since the M823 projectile will be reused many times, it will be rejected only for the following reasons:

(1) Nose cone is cracked or broken.

(2) One or more switches cannot be rotated or will not stay set to a number.

(3) Severe damage to projectile body which could prevent it from being rammed or extracted and cause damage to the interior of the gun tube.

(4) Badly damaged or worn obturator which results in fallback.

(5) Damaged base which prevents proper extraction.

4-25. PREPARATION FOR FIRING

WARNING

Forcing cone in the gun tube must be free of oil and grease before ramming. Oil or grease may permit projectile fallback.

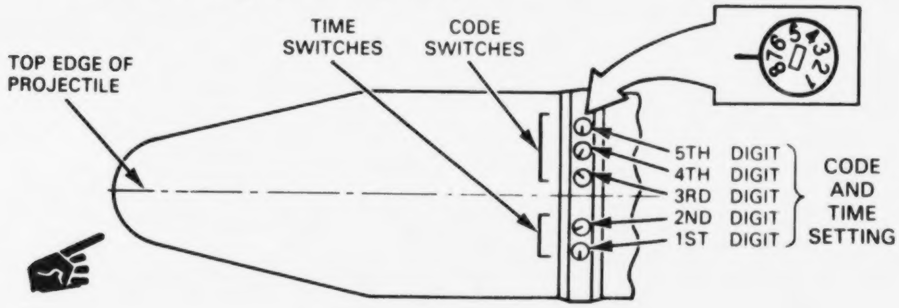
After extracting an M712 projectile from a hot gun tube, forcing cone must be cleaned of melted plastic. Failure to do so may result in projectile fallback. Cleaning may be accomplished by firing another 155-mm round if mission requirements permit or firing a propelling charge alone.

NOTE

For training purposes, the M823 training projectile will be used instead of the M712 projectile. All operational procedures which apply to the M712 also apply to the M823 projectile. However, no live propelling charges are used with the M823 training round.

a. Unpackage and inspect M712 or M823 projectile (para 4-24, p 4-51).

b. Make sure that the extractor assembly is set up and ready for use as described in paragraph 4-27 (p 4-57).



NOTE

Be sure to set switches in correct sequence. Always set first switch on left (looking from base of projectile toward nose) first, then the next switch to the right, etc., until all five switches have been set.

A noticeable click should occur at each number on the switch. This click may be heard and/or felt.

(1) Rotate switch at least one complete turn, either clockwise or counterclockwise.

(2) Continue turning switch past correct number and toward the next adjacent number (but stop before reaching next number).

(3) Turn switch back the other way and set on correct number. Be sure that number on switch is centered on scribe line.

c. After unpackaging the round, set the code and time switches, using a screwdriver or the tang end of the M18 fuze-setter wrench. The fire direction center announces this setting in the fire command in the same place as they usually send "time" for time or VT fuzes. This switch setting will always have five numbers. Switches will be set from left to right as seen when facing the nose of the projectile from the base of the round. The switches are circular dials that can be rotated clockwise or counterclockwise as many times as required without damaging the switches. The appropriate number on the switch must be centered on the scribe line.

d. Set the elevation of the gun tube between 250-500 mils for loading the projectile.

WARNING
The M712 projectile is not adaptable for use with the current loading tray. Damage to projectile or injury to personnel could occur.

e. Carry the prepared projectile to the howitzer. Recheck the nose cone window and obturator cleanness. If necessary, they are wiped clean, using a clean wiping rag (item 13, app D).

f. Visually recheck code and time switches. If numbers are not centered on scribe lines or correct numbers have not been set, set them now following procedures in paragraph c (above). Verify that the steel fin and wing retainer clamps have been removed. If the clamps have not been removed, remove before ramming the round.

g. Insert the M712 projectile into the powder chamber. Ramming and firing of M712 projectile is the same as for all other ammunition in this manual.

4-26. MISFIRE AND CHECKFIRE PROCEDURES

The precautions and actions associated with misfires and checkfires are the same for the M712 projectile as for other projectiles in this manual. See pages 4-40 thru 4-44.1.

4-27. OPERATION OF EXTRACTOR TOOL ASSEMBLY FOR PROJECTILES M712 AND M823

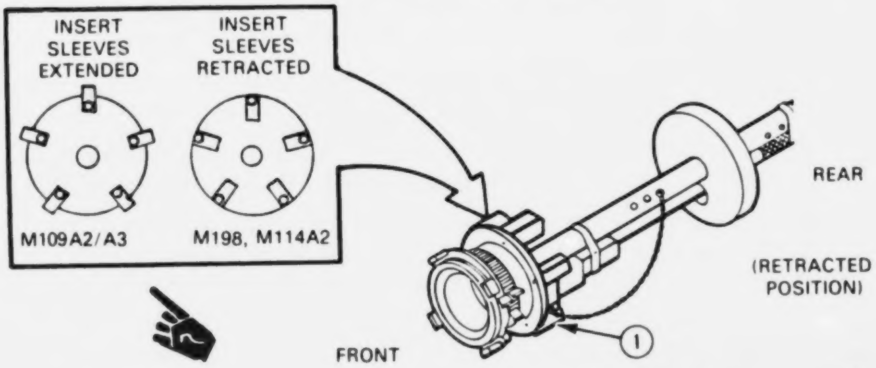
a. **General.** The extractor assembly is used to remove the M712 or M823 projectile from the weapon. The following procedures include setting up the extractor assembly in preparation for use and breakdown procedures for stowage.

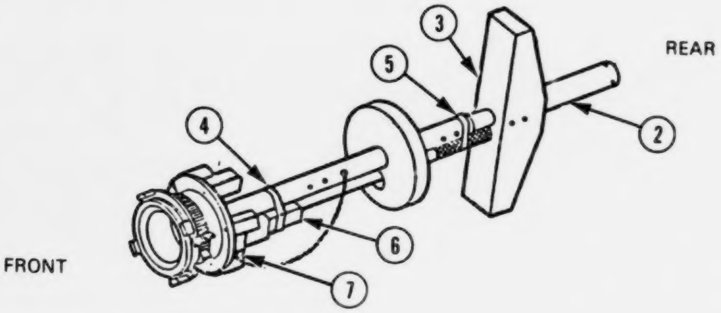
b. **Setup for Use.**

(1) Get extractor assembly from wooden packing box.

NOTE
The 16-inch socket wrench extension will initially be found in the BII box. This extension should be relocated into the box containing the extractor and retained there.

(2) Inspect to make sure that the five insert sleeves (1) on the extractor assembly are retracted for use with an M198 howitzer as shown.




3
REAR
5
4
2
6
FRONT
7

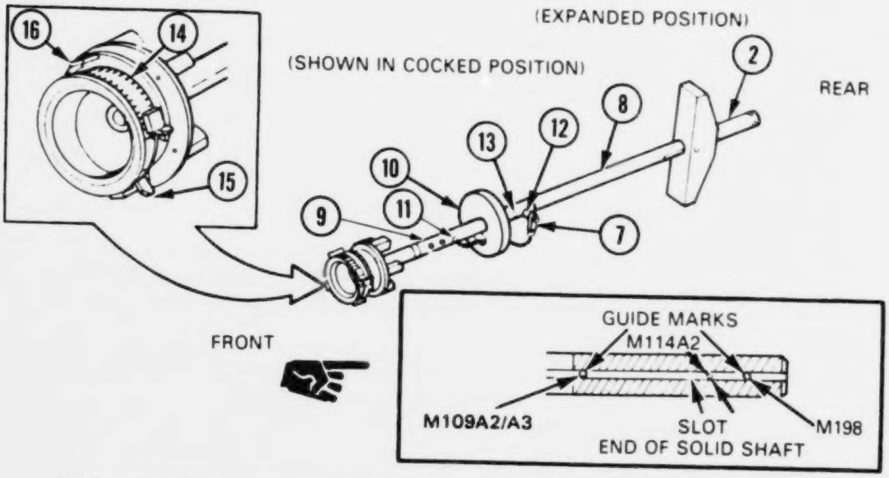
(3) While standing at the rear, loosen drive nut (2) clockwise to farthest white mark.

(4) Move brace (3) back.

(5) Loosen two strap assemblies (4 and 5).

(6) Remove ratchet (6).

(7) Disengage locking pin (7).


16
14
15
(EXPANDED POSITION)
(SHOWN IN COCKED POSITION)
2
REAR
8
13
12
10
11
9
7
FRONT
GUIDE MARKS
M114A2
M109A2/A3
SLOT
END OF SOLID SHAFT
M198

(8) Extend telescoping solid and hollow shafts (8 and 9) until hole in solid shaft (8) alines with farthest hole in hollow shaft (9).

(9) Move alinement support (10) forward, midway between locking pin chain screw (11) and the two holes (12 and 13) at end of the hollow shaft (9).

(10) Guide the locking pin (7) through the slot in alinement support (10).

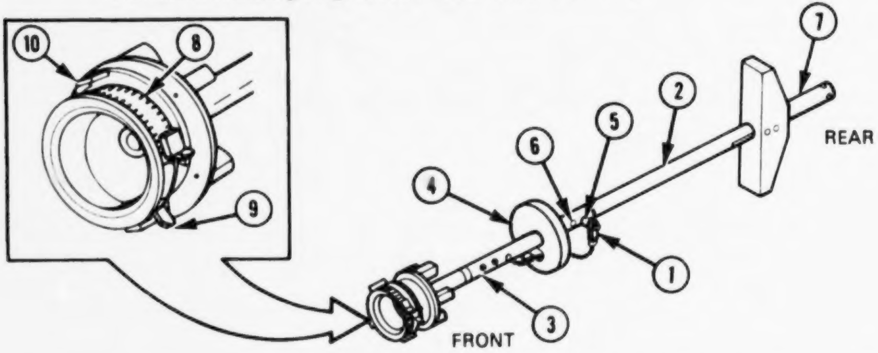
(11) Insert locking pin (7) completely through both shafts (8 and 9) as shown.

(12) Turn drive nut (2) counterclockwise until forward edge alines with guide mark (white) on solid shaft (8). Use rear mark for M198 howitzer. (The forward mark is for use with M109A2/A3 howitzers, middle mark is for use with M114A2 howitzers).

(13) Cock extractor assembly as follows:

(a) Compress expansion ring (14) by squeezing tabs (15) together.

(b) Aline cutout in retaining ring (16) with tabs (15) on expansion ring (14), and slide retaining ring forward over expansion ring.



c. **Setup for Use Under Conditions of Poor Visibility.** If the extractor assembly is being expanded under conditions of poor visibility, the alinement hole and shaft detent may be used as described below.

(1) Disengage locking pin (1), and pull solid shaft (2) from hollow shaft (3).

(2) Move alinement support (4) forward of the two holes (5 and 6) in hollow shaft (3).

(3) Guide locking pin (1) through the slot in alinement support (4).

(4) Insert locking pin (1) in the alinement hole (6) (second hole from end of hollow shaft).

(5) Insert solid shaft (2) in hollow shaft (3), and rotate until alinement detent in end of solid shaft rests against locking pin (1).

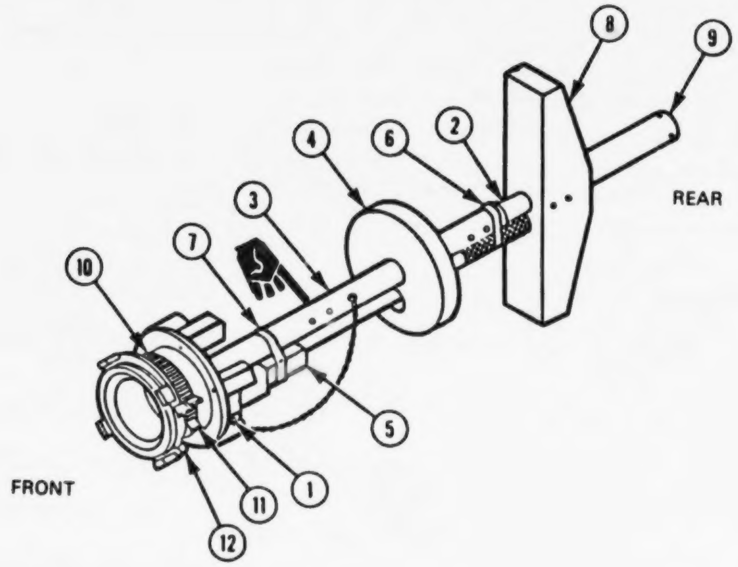
(6) While holding both shafts to prevent them from turning or sliding, remove locking pin (1) from alinement hole (6); and insert locking pin completely through farthest hole (5) to lock both shafts in extended position.

(7) Turn drive nut (7) counterclockwise until forward edge alines with guide mark (white) on solid shaft (2). Use rear mark for M198 howitzer. (The forward mark is for use with M109A2/A3 howitzers, middle mark is for use with M114A2 howitzers).

(8) Cock extractor assembly as follows:

(a) Compress expansion ring (8) by squeezing tabs (9) together.

(b) Aline cutout in retaining ring (10) with tabs (9) on expansion ring (8), and slide retaining ring forward over expansion ring.



d. Breakdown for Stowage.

(1) Disengage locking pin (1), and compress telescoping solid and hollow shafts (2 and 3) to retracted position.

(2) Guide locking pin (1) through slot in alinement support (4).

(3) Insert locking pin (1) completely through solid shaft (2) and hollow shaft (3).

(4) Remove ratchet (5) and extension, and guide ratchet handle through the slot in alinement support (4).

(5) Strap ratchet (5) to hollow shaft (3), using the strap assemblies (6 and 7) provided.

(6) Slide brace (8) forward until it touches end of ratchet handle. Turn drive nut (9) counterclockwise until brace (8) is held firmly against ratchet handle.

(7) Check to see if extractor assembly is cocked. If it is not cocked, perform the following:

(a) Compress expansion ring (10) by squeezing tabs (11) together.

(b) Aline cutout in retaining ring (12) with tabs (11) on expansion ring (10), and slide retaining ring forward over expansion ring.

(8) Stow extractor assembly and extension in wooden packing box.

4-28. UNLOADING AN M712 OR M823 PROJECTILE

CAUTION

Do not use bell rammer to unload the **M712** or **M823** projectile.

a. **Removal of Primer and Propelling Charge.**

(1) Remove primer and propelling charge as prescribed in this manual.

(2) Elevate/depress gun tube to approximately 300 mils.

b. **Unloading M712 and M823 Projectile.** Unload M712 or M823 projectile following the steps listed below.

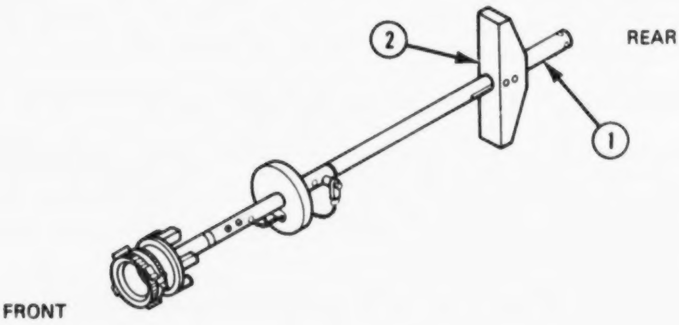
(1) Obtain extractor assembly.

(2) Check to see if extractor assembly is cocked. If expansion ring is cocked, proceed to (3) below; otherwise, cock extractor assembly as follows:

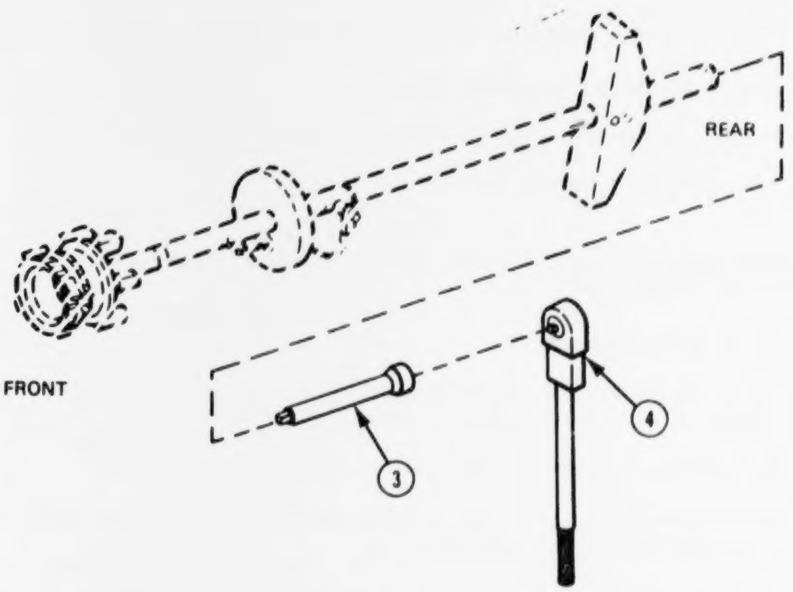
(a) Compress expansion ring by squeezing tabs together.

(b) Aline cutout in retaining ring with tabs on expansion ring, and slide retaining ring forward over expansion ring.

(3) Insert extractor assembly through breechring assembly until forward end makes contact with base of projectile. Push extractor assembly firmly against projectile until expansion ring is seated in the base of the projectile. Pull on extractor assembly to make sure that it is engaged with projectile. If extractor assembly did not engage, remove it from gun tube and repeat procedures in steps (2)(a) and (b) and this step.



(4) Turn extractor drive nut (1) counterclockwise by hand until brace (2) touches and is centered across face of breechring assembly.



(5) Insert socket wrench extension (3) into ratchet (4). Connect ratchet to end of drive nut. Set ratchet to OFF, and turn ratchet counterclockwise until projectile is pulled free of forcing cone. Remove ratchet and socket wrench extension from drive nut.

(6) Let projectile and extractor assembly slide slowly out of gun tube until base of projectile has passed through breechring assembly. Projectile will have to be raised slightly to pass obturator over Swiss groove.

(7) Release extractor assembly by squeezing tabs on expansion ring.

(8) Remove the projectile from howitzer, being careful not to strike plastic nose cone, and repackage the projectile. If the projectile has been unloaded from a hot gun tube, remove it to a safe distance from personnel, and notify EOD for disposal.

4-29. M712 AMMUNITION PREPARED FOR FIRING, BUT NOT FIRED

a. **General.** M712 projectiles that have been unpackaged (in accordance with paragraph 4-24.a.) but not fired, will be repacked within 30 days and returned to battalion ammunition section for further disposition. Long exposure of the projectile to sunlight and other elements may cause it to fail. Code and time switch settings made during preparation need not be reset. A projectile that has been unloaded from a weapon as a result of a misfire or checkfire will be repackaged as described below.

b. **Repackaging Projectile.** Repackage the M712 projectile as follows:

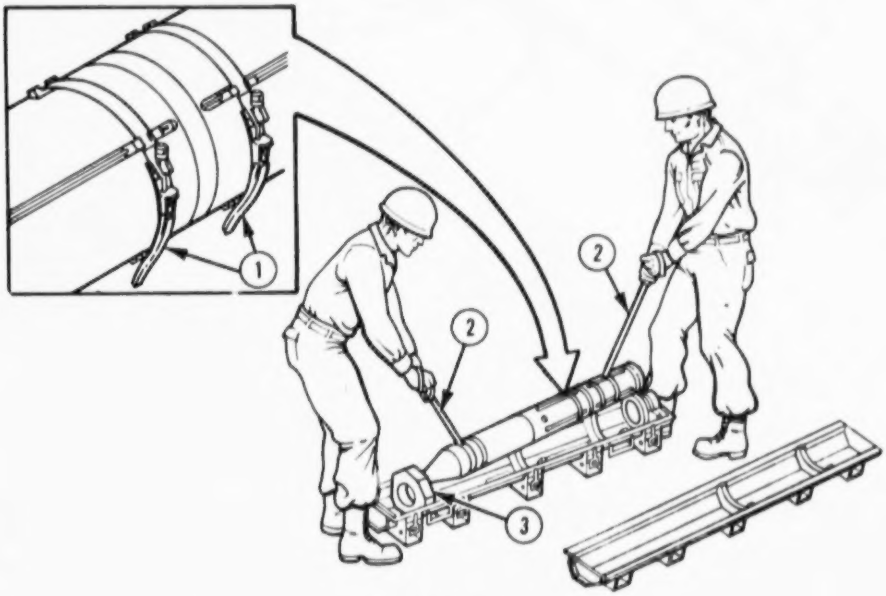
(1) Using wiping rag (item 13, app D), wipe all loose dirt and moisture from projectile.

(2) Locate original container. If container has become unserviceable, replace it. If original container cannot be found or has been replaced for unserviceability, make sure that markings on replacement container match markings on projectile. If not, return to battalion ammunition section for remarking.

(3) Install projectile into container as follows:

(a) Check red decals, stamp, or stencil (if present) at nose end of container halves to assure numbers on decals match.

(b) Open container, and remove lifting straps. Also remove fin and wing preload bands.



CAUTION

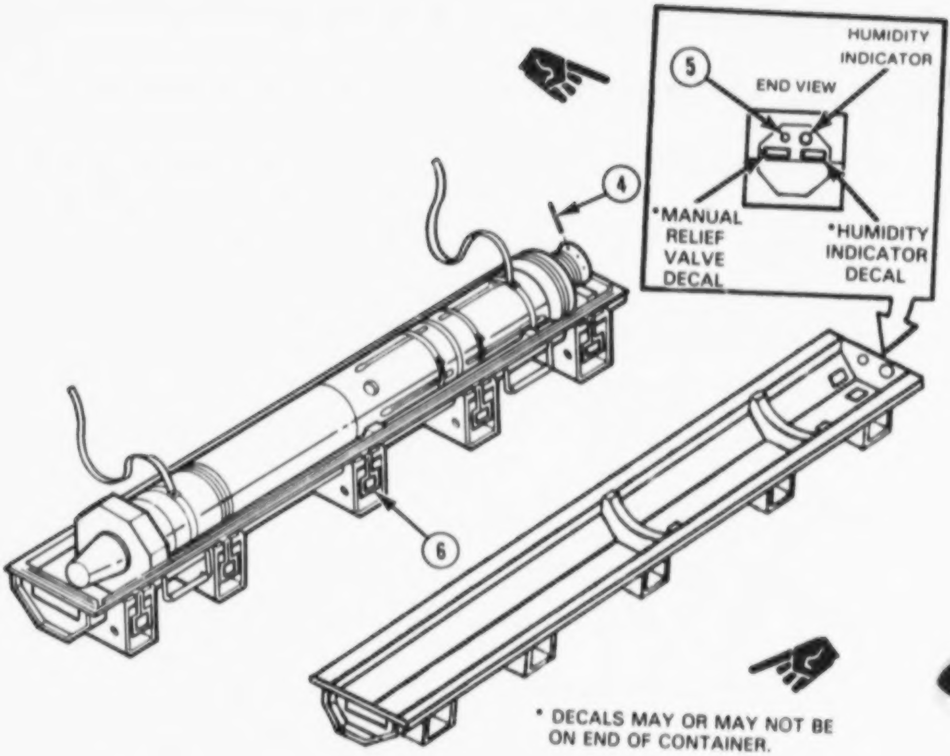
Make sure that all four fin and wing preload bands securely engage fins and wings.

(c) Install fin and wing preload bands (1) on projectile.

(d) Install lifting straps (2) on projectile.

(e) Lift projectile, and position over opened container.

(f) Carefully lower projectile, guiding nose cone into retainer ring (3) in the container.



* DECALS MAY OR MAY NOT BE ON END OF CONTAINER.

(g) Using torquing rod (4), turn tension mechanism clockwise as far as possible to snug projectile into the retainer ring. Place rod in holes in mechanism horizontal, or as close as possible, to avoid interference with stops inside cover.

(h) Be sure that desiccant and protective bag are placed inside container.

(i) Place container cover on container body in such a manner that the inside cradles are alined and the manual relief valve (5) and the humidity indicator card are at the rear end of the container.

(j) Starting on the end opposite the humidity indicator card, straddle container, place T-bolts in cover recesses, and close corresponding left and right side latches (6) at the same time in pairs.

4-30. M712 PROJECTILE MAINTENANCE

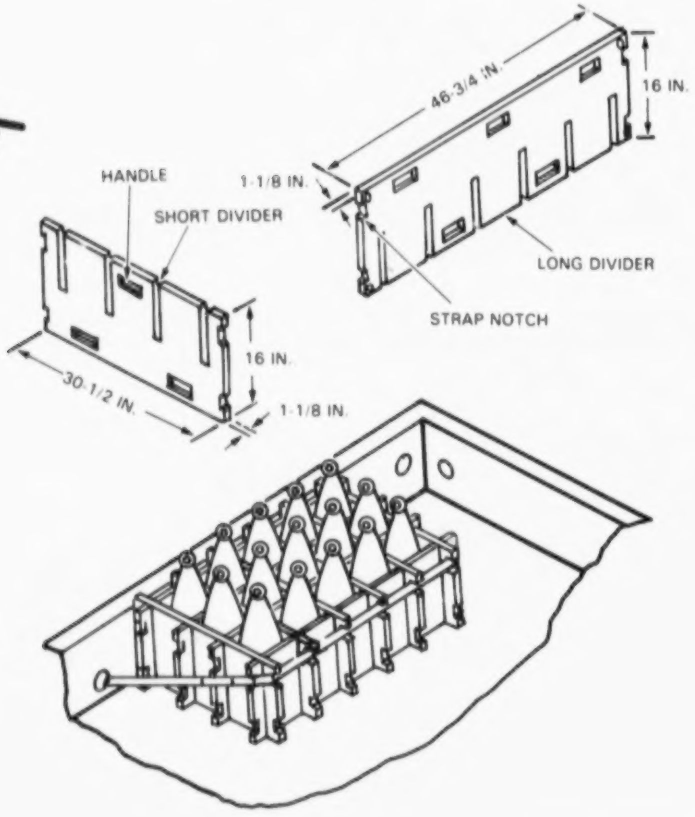
Humidity indicators on package M712 Projectiles must be monitored for humidity every 90 days, as a minimum. If relative humidity in the container is 40 percent or greater (40 percent sector of humidity indicator card is not blue), follow instructions in paragraph 4-24. a.

4-31. LOOSE PROJECTILE RESTRAINT SYSTEM (LPRS)

a. **General.** The LPRS is a divider rack that provides a fast, simple method of securing "loose" unfuzed projectiles for transportation in a field artillery companion vehicle. The rack restrains projectiles from excessive longitudinal and lateral movement and from contact with other projectiles. The rack is easily assembled, using a quantity of short and/or long plastic dividers that fit together. Projectiles are then placed vertically in the rack, with the base of each projectile resting on the floor of the vehicle. The assembly is then secured to the sidewall of the vehicle by means of cargo tiedown straps. After use, the rack may be disassembled and stored for reuse.

b. **Use of LPRS.** Use of LPRS is optional and the components are listed in Appendix D, Expendable/Durable Supplies and Materials List.

c. **Instructions.** Complete instructions for use of the LPRS are found in TM 9-2590-210-10, Loose Projectile Restraint System (LPRS) for use with Field Artillery Companion Vehicles.



CHAPTER 5
FOREIGN AMMUNITION (NATO)

5-1. GENERAL

a. Agreements between the United States and NATO allies have established the interoperability of weapon systems and ammunition of the nations. The agreements enable the safe and effective firing of major types of ammunition of the same size from the same compatible size and type weapon of the NATO armies.

b. The following pages cover *only authorized* German (GE), United Kingdom (UK), Canadian (CA), Netherlands (NL), French (FR), Norwegian (NO), Italian (IT), Danish (DA), Greek (GR), or Belgian (BE) 155-mm components. If a munitions item has not yet been authorized, it is because either it has not yet been determined to be safe to fire, or it has been determined that the munitions item *cannot* be safely fired from the US weapon system.

WARNING

Only under emergency combat conditions will zone 1 of the M3A1 and DM62 propelling charge be fired from the M199 cannon tube of the M198 howitzer weapon system.

•

Do not mix US, GE, UK, CA, NL, FR, NO, IT, DA, GR, or BE components (i.e., projectile, propelling charge, flash reducer, fuze). Fire only all components from one nation, except GE primer DM191A1. GE must use DM191A1 when firing US, GE, UK, CA, NL, NO, IT, DA, GR, or BE 155-mm munitions.

NOTE

At the conclusion of any training exercise, ammunition drawn from a NATO nation and not fired should be returned to the troops of the NATO nation from whom it was obtained.

5-2. AUTHORIZED PROJECTILES

a. The following GE munitions are authorized for use in M198 howitzers:

Projectile	155-mm, HE, DM21 (TNT-loaded only)
Charge, propelling	Green bag, DM62, zones 1-5
Charge, propelling	White bag, DM42B1, zones 3-7
Fuze	Point-detonating, DM211
Primer	Use only US M82 primer. Do not use GE DM191A1 primer.

5-2. AUTHORIZED PROJECTILES (cont)

b. The following UK munitions are authorized for use in M198 howitzers:

Projectile	155-mm, HE, M107 (TNT-loaded only)
Charge, propelling	Green bag, M3A1, zones 1-5
Charge, propelling	White bag, M4A2, zones 3-7
Fuze	Point-detonating, M557, L85A2
Primer	M82

c. The following CA munitions are authorized for use in M198 howitzers:

Projectile	155-mm, HE, M107
Charge, propelling	M3*, M3A1, M4A1*, M4A2
Fuze	Point-detonating, M557, M564 Proximity, M514A1
Primer	M82

d. The following NL munitions are authorized for use in M198 howitzers:

Projectile	155-mm, HE, M107, M107C1** (TNT-loaded only)
Charge, propelling	M3C1**, M4C3**, M4A1
Fuze	Point-detonating, M557, M557C1**
Primer	M82, M82C1**

e. The following FR munitions are authorized for use in M198 howitzers:

Projectile	155-mm, HE, M107
Charge, propelling	Green bag, M3*, zones 1-5
Charge, propelling	White bag, M4A1*, zones 5-7
Fuze	Point-detonating, M557
Primer	Use US M82 only, not MK2A4

NOTE

FR troops must use MK2A4 primer in FR F3 AMSP weapon.

f. The following NO munitions are authorized for use in M198 howitzers:

WARNING

Do not fire M107 projectiles when lot number starts with RA.

Interchange firings will be with TNT-loaded M107 projectiles only.

---

*These charges do not have flash reducers.

**NL manufacture

5-2. AUTHORIZED PROJECTILES (cont)

f. (cont)

Projectile	155-mm, HE, M107 (TNT-loaded only)
Charge, propelling	Green bag, M3A1, zones 1-5
Charge, propelling	White bag, NM23 (same as US M4A2), zones 3-7
Fuze	Point-detonating, M557
Primer	M82

NOTE

Except as noted above, preparation for firing GE, UK, CA, NL, FR, NO, IT, DA, GR, and BE munitions in US weapons system (preparation for firing, precautions during firing, misfire procedures, etc.) are contained in chapter 4 of this manual.

g. The following IT munitions are authorized for use in M198 howitzers:

Projectile	155-mm, HE, M107 (TNT-loaded only)
Charge, propelling	Green bag, M3A1, zones 1-5
Charge, propelling	White bag, M4A2, zones 3-7
Fuze	Point-detonating, M557, MTSQ, M564
Primer	M82

h. The following DA munitions are authorized for use in M198 howitzers:

Projectile	155-mm, HE, M107 (TNT-loaded only)
Charge, propelling	Green bag, M3*, M3A1, zones 1-5
Charge, propelling	White bag, M4A1*, M4A2, zones 3-7
Fuze	Point-detonating, M557C1, MTSQ, M564
Primer	M82

i. The following GR munitions are authorized for use in M198 howitzers:

Projectile	155-mm, HE, M107, M107B2 (TNT-loaded only)
Charge, propelling	Green bag, M3*, M3A1, zones 1-5
Charge, propelling	White bag, M4A1*, M4A2, zones 3-7
Fuze	Point-detonating, M557, MTSQ, M564
Primer	M82

j. The following BE munitions are authorized for use in M198 howitzers:

Projectile	155-mm, HE, M107 (TNT-loaded only)
Charge, propelling	Green bag, M3A1, zones 1-5
Charge, propelling	White bag, M4A2, zones 3-7

---

*These charges do not have flash reducers.

5-2. AUTHORIZED PROJECTILES (cont)

j. (cont)

Fuze	Point-detonating, M557, MTSQ, M564
Primer	M82

k. The following US munitions are authorized for use in GE M109, UK M109, CA M109, NL M109, FR F3 AM, and NO M109G and M114 series weapon systems:

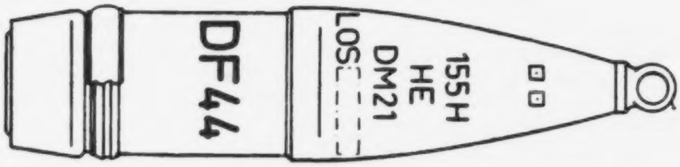
NOTE

During training exercises, give either TNT- or Comp B-loaded 155-mm, HE, M107 projectiles to UK, NL, and FR troops.

Projectile	155-mm, HE, M107
Charge, propelling	Green bag, M3A1, zones 1-5
Charge, propelling	White bag, M4A2, zones 3-7
Primer	M82 (GE use DM191A1; FR F3 AM use MK244)

l. The authorized projectiles and their characteristics are as follows:

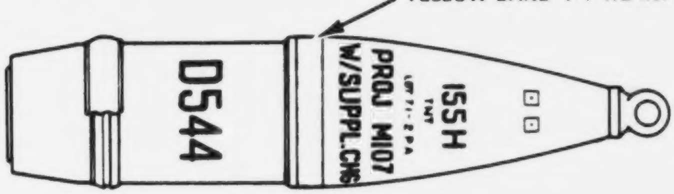
DM21 PROJECTILE



(1) Projectile, 155-mm, HE, DM21 (GE). This high explosive projectile is used for blast effect, fragmentation, and mining. The projectile is a hollow steel shell filled with TNT. Point-detonating fuze is used with this projectile. A supplementary charge of 0.3 lb (0.136 kg) TNT is sealed in an aluminum container placed in the fuze cavity of the projectile. The projectile weighs approximately 92.0 lb (41.7 kg).

5-2. AUTHORIZED PROJECTILES (cont)

M107 PROJECTILE



YELLOW BAND 1-1-1/2 IN. WIDE

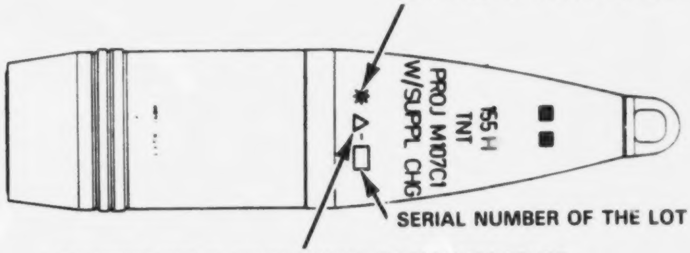
(PROJECTILES, AS MANUFACTURED,
DO NOT HAVE THIS BAND. IT IS ADDED
ONLY WHEN PROJECTILE IS RENOVATED (UK ONLY).)

(2) Projectile, 155-mm, HE, M107 (Normal and Deep Cavity) (UK, CA, and NL). This high explosive projectile is used for blast effect, fragmentation, and mining. The projectile is a hollow steel shell filled with TNT. Point-detonating fuze is used with this projectile. A supplementary charge of 0.3 lb (0.136 kg) TNT is sealed in an aluminum container placed in the fuze cavity of this projectile. The projectile weighs approximately 92.3 lb (41.9 kg).

NOTE

With the exception of a yellow hazard band around the body of renovated projectiles, these UK munitions are identical to US munitions.

M107C1 PROJECTILE



INITIALS OF MANUFACTURER

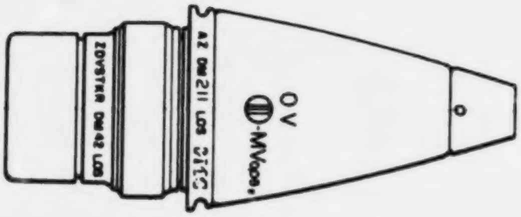
SERIAL NUMBER OF THE LOT

LAST TWO DIGITS OF THE YEAR OF MANUFACTURE

(3) Projectile, 155-mm, HE, M107C1 (NL). This high explosive projectile is used for blast effect, fragmentation, and mining. The projectile is a hollow steel shell filled with TNT. Point-detonating, time, or proximity (deep cavity only) fuzes may be used. The projectile weighs approximately 92.3 lb (41.9 kg).

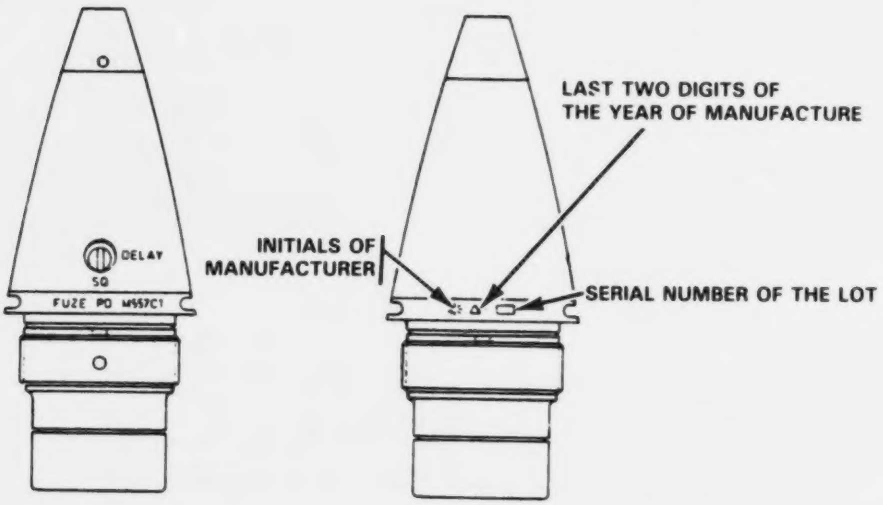
5-3. AUTHORIZED FUZES

DM211 FUZE


AZ DM211 LOS
ZDVSTKR DM42 LOS
O V
MVoos.

a. **Fuze, Point-Detonating, DM211 (GE and NO).** The DM211 fuze has a superquick (SQ) element in the head consisting of a firing pin, firing pin support, and detonator. The fuze body contains a delay plunger assembly and a selective setting device for superquick or delay action. The DM211 fuze is similar to the US fuze M557.

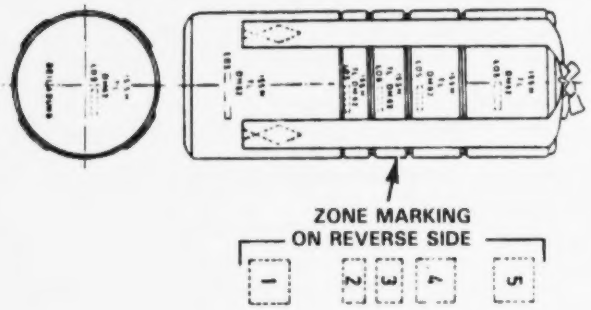
M557C1 FUZE


DELAY
SQ
FUZE PD M557C1
LAST TWO DIGITS OF THE YEAR OF MANUFACTURE
INITIALS OF MANUFACTURER
SERIAL NUMBER OF THE LOT

b. **Fuze, Point-Detonating, M557C1 (NL).** The M557C1 fuze is a selective superquick or 0.05-second delay impact fuze. The M557C1 fuze is a US M557 fuze with booster M125C1 of Italian manufacture. This booster is the same design as the US M125A1 except that it is fitted with a setback pin which locks one of the spin locks.

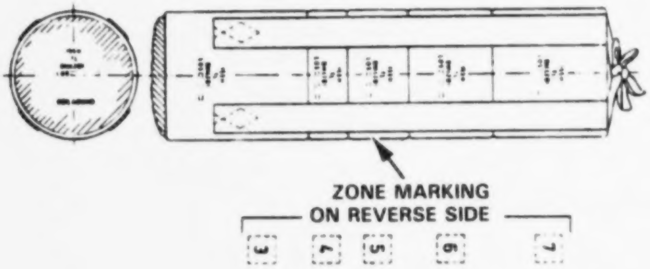
5-4. AUTHORIZED PROPELLING CHARGES

DM62 PROPELLING CHARGE



a. **Propelling Charge, DM62 (GE).** This is a green bag charge consisting of a base charge and four unequal increments loaded in cloth bags for firing in zones 1 thru 5. The bags are fastened together with four cloth straps sewn to the base and tied on top of increment no. 5. The clean-burning igniter in a red or brown cloth bag is sewn to the rear of the base charge.

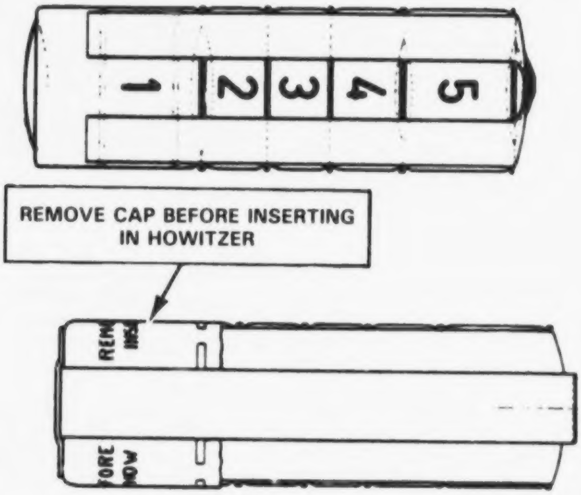
DM42B1 PROPELLING CHARGE



b. **Propelling Charge, DM42B1 (GE).** This is a white bag charge consisting of a base charge and four unequal increments loaded in cloth bags for firing in zones 3 thru 7. The increments are connected by four cloth tapes sewn to the base and tied on top of increment no. 7. The clean-burning igniter in a red or brown cloth pad is sewn to the bottom of the base charge. A flash reducer pad is assembled at the front end of the base charge.

5-4. AUTHORIZED PROPELLING CHARGES (cont)

M3C1 PROPELLING CHARGE


1
2
3
4
5
REM
INS
ORE
OW

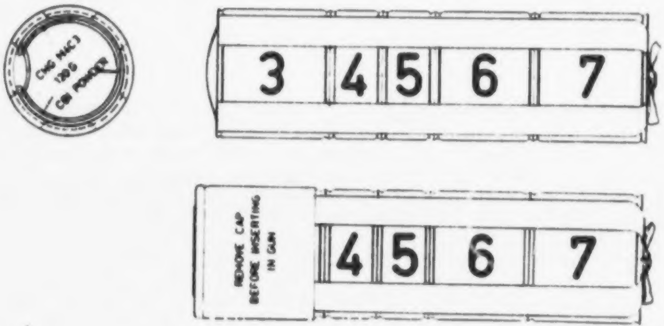
REMOVE CAP BEFORE INSERTING IN HOWITZER

NOTE

Lot number of assembled propellent charge is shown on the base charge and all supplemental charges.

c. **Propelling Charge, M3C1 (NL).** This is a green bag charge consisting of a base charge and four unequal increments loaded in cloth bags for firing in zones 1 thru 5. The bags are fastened together with four cloth straps sewn to the base and tied on top of increment no. 5. It has a flash reducer pad in front of the base charge and two flash reducer pads in front of increments no. 4 and 5. The clean-burning igniter in a red cloth bag is sewn to the rear of the base charge.

M4C3 PROPELLING CHARGE


CHG M4C3
CBI POWDER
3
4
5
6
7
REMOVE CAP BEFORE INSERTING IN GUN
4
5
6
7

NOTE

Lot number of assembled propellent charge is shown on the base charge and all supplemental charges.

d. **Propelling Charge, M4C3 (NL).** This is a white bag charge consisting of a base charge and four unequal increments loaded into cloth bags for firing in zones 3 thru 7. The increments are connected by four cloth tapes sewn to the base and tied on top of increment no. 7. The clean-burning igniter in a red cloth pad is sewn to the bottom of the base charge (increment no. 3). A flash reducer pad is assembled at the front end of the base charge (increment no. 3).

CHAPTER 6

DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

6-1. GENERAL

a. If subject to capture or abandonment in the combat zone, the M198 howitzer will be destroyed only when, in the judgement of the unit commander, such action is necessary in accordance with orders or policy of the Army Commander.

b. The information which follows is for guidance only. Certain procedures require the use of demolition charges and incendiary grenades which may not be authorized items for the using organization. The issue of these and related materials and the conditions under which the howitzer will be destroyed are command decisions, according to the tactical situation. Destruction of essential parts followed by burning will usually be enough to make the materiel useless. Selection of the particular method of destruction requires imagination and resourcefulness in using the facilities at hand under the existing conditions. Time is critical. The most applicable means of destruction are as follows:

Mechanical	Requires axe, pick mattock, sledge, crowbar, or similar implement.
Demolition	Requires suitable explosives or ammunition.
Burning	Requires gasoline, oil, incendiary grenades, or other flammables.
Gunfire	Includes artillery, machine guns, rifles using rifle grenades, and launchers using antitank rockets. Under some circumstances, hand grenades may be used.

c. If the howitzer is to be destroyed, the materiel must be so badly damaged that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the materiel, including essential spare parts, be destroyed or damaged beyond repair. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like materiel so that the enemy cannot construct one complete unit from several damaged ones.

d. If destruction is ordered, these procedures should be followed:

(1) Select a point of destruction that will cause the greatest obstruction to enemy movement and also prevent hazard to friendly troops from fragments or ricocheting projectiles.

(2) Observe appropriate safety precautions.

6-2. DESTRUCTION OF FIRE CONTROL EQUIPMENT

All fire control equipment, especially such items as telescopes, gunner's quadrants, binoculars, and similar items, is costly, difficult to replace, yet relatively light. It should be conserved and evacuated whenever practicable. If evacuation is impracticable, the equipment will be destroyed completely. The preferred means of destruction of radioactively illuminated fire control is by demolition, burning, or gunfire. If by demolition, miscellaneous fire control components may be placed on or near auxiliary charges. Small charges should be placed at the main fire control attachment points. If the tactical situation mandates mechanical destruction, primary attention should be given to lenses, control knobs, mounting surfaces, and counters. After destruction, personnel should immediately wash with soap (item 14, app D) and water. Firing tables and other flammable items will be burned.

6-3. DESTRUCTION OF THE M199 CANNON AND M39 CARRIAGE

If time, personnel, and materials are available, the destruction of the complete towed weapon should be accomplished by means of demolition materials, burning, or gunfire. If time, personnel, or materials are limited, priority should be given to the destruction of the cannon. Pneumatic tires should be destroyed as described on page 6-4.

a. Method No. 1. Destruction with Demolition Charges.

(1) For simultaneous detonation, prepare and place demolition charges (1-lb (0.45-kg) TNT blocks or equivalent, with the necessary detonating cord) as indicated below:

Charge	Location of Charge
2-lb (0.91-kg)	Insert charge into cannon tube.
2-lb (0.91-kg)	Place charge next to recoil mechanism.
2-lb (0.91-kg)	Place charge on carriage next to left wheel and spindle.
2-lb (0.91-kg)	Place charge on carriage next to right wheel and spindle.

(2) Connect the charge for simultaneous detonation with detonating cord.

(3) Detonate the charges. For complete details on the use of demolition materials and methods of priming and detonating demolition charges, refer to FM 5-25. Training and careful planning are essential. The danger zone is approximately 250 meters.

Elapsed time: About 10 minutes.

b. Method No. 2. Destruction by Burning.

WARNING

Do not strike equilibrator or recoil mechanism parts as they could explode and injure personnel.

(1) **With combustible materials.**

(a) Using an axe, pick mattock, sledge, or similar implement, smash the brake lines, hydraulic lines, fire control equipment handwheels, and ball screws.

(b) Destruction of essential parts, followed by burning in an intense fire, will usually make the cannon and carriage useless. Since the cannon and carriage are almost entirely metal, except for pneumatic tires, enough quantities of combustibles should be used to ensure a very hot fire.

(c) If explosive ammunition is available, place the unpacked ammunition on and above the cannon and carriage.

(d) Pour gasoline or oil over the combustible material.

WARNING

Cover must be taken without delay since an early explosion of the explosive ammunition may be caused by the fire. If explosive ammunition is present, the danger area is 250 meters.

(e) Ignite by means of an incendiary grenade fired from a safe distance, by a burst from a flame thrower, by a combustible train of suitable length, or by other appropriate means. Take cover immediately.

Elapsed time: About 6 minutes.

(2) **With incendiary grenades.** If large quantities of combustibles are not available, use incendiary grenades as follows:

WARNING

Each roll of time blasting fuze must be tested shortly before use. The rate of burning will vary for the same or different roll under different atmospheric and/or climatic conditions, from a burning time of 30 seconds or less per foot to 45 seconds or more per foot.

Time blasting fuzes shall be of sufficient length to allow personnel enough time to safely leave the cannon and carriage after igniting the fuzes.

(a) Insert two incendiary grenades end-to-end in the muzzle of the cannon tube. The two grenades will be ignited by means of a third grenade fitted with a length of time blasting fuze. The metal from the grenades will fuze with the tube.

(b) Place the fourth and fifth grenades on the carriage; the first next to the left wheel and spindle and the second next to the right wheel and spindle. The two grenades will be ignited by a sixth grenade fitted with a length of time blasting fuze.

(c) Place a seventh grenade next to the recoil mechanism. This grenade will be ignited by an eighth grenade fitted with a length of time blasting fuze.

Elapsed time: About 5 minutes.

WARNING

Firing artillery at ranges of 460 meters or less should be from cover. Firing rifle grenades or antitank rockets should be from cover.

c. **Method No. 3. Destruction by Gunfire.** This method cannot be relied upon to destroy the same parts of all cannons and carriages or to produce the same degree of destruction. Fire on the cannons and carriages, using nearby artillery machine guns, rifles using rifle grenades, or launchers using antitank rockets. Although one well-placed direct hit may render the cannon and carriage temporarily useless, several hits are usually required for complete destruction.

Elapsed time: About 5 minutes.

6-4. DESTRUCTION OF PNEUMATIC TIRES

An attempt must always be made to destroy pneumatic tires, even if time will not permit destruction of the remainder of the carriage. The destruction of tires by means of incendiary grenades should be accomplished in conjunction with the destruction of the weapon.

a. **Method No. 1. Destruction by Incendiary Grenades.**

WARNING

Do not use WP (white phosphorous) grenades to destroy the tires. WP grenades burst and throw the burning white phosphorous particles as far as 30 meters.

(1) Ignite an incendiary grenade under each tire.

(2) When this method is combined with the destruction of materiel by means of demolition materials, the detonation of demolition charges should be delayed until the incendiary fires are well started to avoid the possibility of the flames being extinguished by the blast of the explosion.

Elapsed time: About 2 minutes.

b. **Method No. 2. Destruction by Slashing.** If tires are inflated, use care to prevent injury should the tire blow out while being slashed. Whenever practicable, deflate the tires before slashing.

Elapsed time: About 3 minutes.

APPENDIX A
REFERENCES

A-1. SCOPE

This appendix lists all forms, field manuals, technical manuals, and technical bulletins referenced in this manual.

A-2. FORMS

Equipment Inspection and Maintenance Worksheet	DA Form 2404
Product Quality Deficiency Report	Standard Form 368
Recommended Changes to Equipment Technical Manuals	DA Form 2028-2
Recommended Changes to Publications and Blank Forms	DA Form 2028
Weapon Record Data Card	DA Form 2408-4

A-3. FIELD MANUALS

Basic Cold Weather Manual	FM 31-70
Explosives and Demolition	FM 5-25
Field Artillery Cannon Gunnery	FM 6-40
First Aid for Soldiers	FM 21-11
NBC (Nuclear, Biological, and Chemical) Decontamination	FM 3-5
NBC Defense	FM 21-40
NBC Reconnaissance and Decontamination Operations	FM 3-87
Northern Operations	FM 31-71
Operation and Maintenance of Ordnance Materiel in Cold Weather (0° to -65°F)	FM 9-207

A-4. TECHNICAL MANUALS

Army Ammunition Data Sheets for Artillery Ammunition: Guns, Howitzers, Mortars, Recoilless Rifles, Grenade Launchers and Artillery Fuzes (FSC 1310, 1315, 1320, 1390)	TM 43-0001-28
Operator's Manual, Projectile, 155-Millimeter: GB2, M687	TM 3-1320-242-10

A-4. TECHNICAL MANUALS—Continued

Deepwater Fording of Ordnance Materiel	TM 9-238
Hand Receipt Manual Covering Basic Issue Items (BII) and Additional Authorization List (AAL) Related to: Howitzer, Medium, Towed: 155-MM, M198, NSN 1025-01-026-6648	TM 9-1025-211-10-HR
Operator and Organizational Maintenance Manual for M90 Radar Chronograph	TM 9-1290-359-12&P
Operator's Manual: Loose Projectile Restraint System (LPRS) for Use with Field Artillery Companion Vehicles	TM 9-2590-210-10
Operator's and Organizational Maintenance Manual; Computer, Gun Direction CP 1317/GYK-29	TM 11-7440-283-12-1
Operator's and Organizational Maintenance Manual; Data Display Group OD-144/GYK-29	TM 11-7440-283-12-2
Operator's Manual: Radio Set, AN/PRC-68	TM 11-5820-882-10
Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Evaluation of Cannon Tubes	TM 9-1000-202-14
Organizational Maintenance Manual (Including Repair Parts and Special Tools Lists): Artillery Ammunition for Guns, Howitzers, Mortars, Recoilless Rifles, and 40-MM Grenade Launchers	TM 9-1300-251-20

A-5. TECHNICAL BULLETINS

Munitions: Permanently Suspended or Restricted	TB 9-1300-385-2
Munitions: Suspended or Restricted	TB 9-1300-385-1

A-6. OTHER

Army Medical Department Expendable/Durable Items	CTA 8-100
Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items)	CTA-50-970
Lubrication Order for Howitzer, Medium, Towed: 155-MM, M198 (1025-01-026-6648)	LO 9-1025-211-13
The Army Maintenance Management System (TAMMS), as contained in Maintenance Management Update	DA PAM 738-750

APPENDIX B
COMPONENTS OF END ITEM LIST

Section I. INTRODUCTION

B-1. SCOPE

This appendix lists integral components of and basic issue items for the M198 howitzer to help you inventory items required for safe and efficient operation.

B-2. GENERAL

This Components of End Item List is divided into the following sections:

a. **Section II.** Integral Components of End Item. These items, when assembled, comprise the M198 howitzer and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. **Section III.** Basic Issue Items. These are the minimum essential items required to place the M198 howitzer in operation, to operate it, and to perform emergency repairs. Although shipped separately packed, they must accompany the M198 howitzer during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII based on TOE/MTOE authorization of the end item.

B-3. EXPLANATION OF COLUMNS

a. **Illustration Number**. Indicates the number of the illustration on which the item is shown.

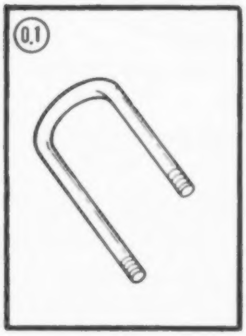
b. **National Stock Number (NSN)**. Indicates the National stock number assigned to the item and which will be used for requisitioning.

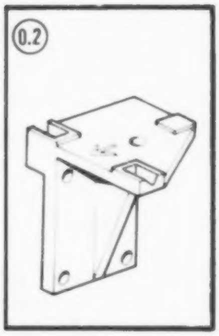
c. **Description, Part Number, and Federal Supply Code for Manufacturer (FSCM)**. Indicates the National item name and, if required, a minimum description to identify the item. Part number indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. FSCM is in parentheses.

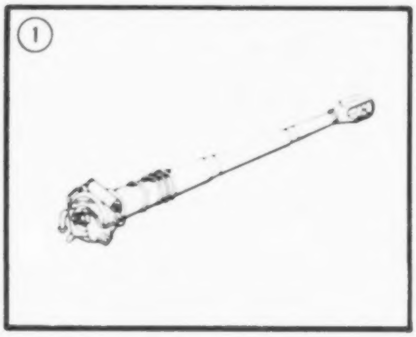
d. **Quantity Furnished**. Indicates the quantity of each item required for a complete major item.

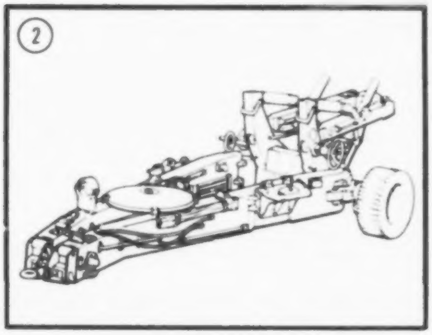
Section II. INTEGRAL COMPONENTS OF END ITEM

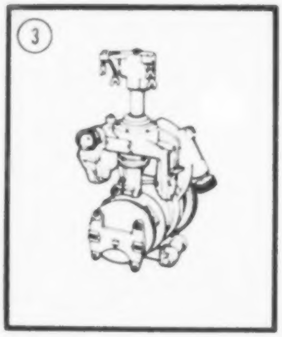
ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
0.1	5306-01-124-0246	BOLT, U 11785077 (19200)	2
0.2	1290-01-127-7817	BRACKET, ANTENNA MOUNTING 11785076 (19200)	1
1	. . .	CANNON, M199 11578880 (19206)	1
2	. . .	CARRIAGE, M39 12007600 (19200)	1
3	1240-01-039-7273	MOUNT, TELESCOPE AND QUADRANT, M171 11727800 (19200)	1





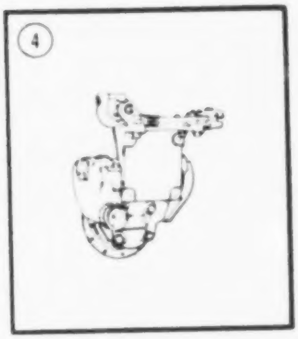


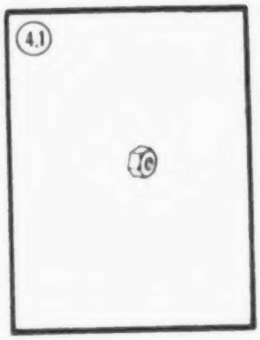


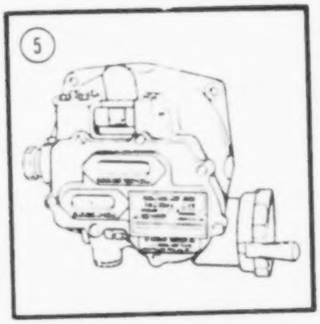


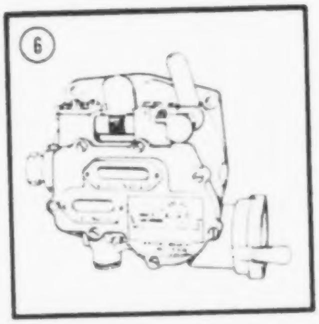
INTEGRAL COMPONENTS OF END ITEM – Continued

ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
4	1240-01-037-7290	MOUNT, TELESCOPE AND QUADRANT, M172 10554823 (19200)	1
4.1	5310-00-005-0410	NUT, PLAIN, HEXAGON MS51971-4 (96906)	4
5	1290-01-037-3883	QUADRANT, FIRE CONTROL, M17 11729530 (19200)	1
6	1290-01-037-7289	QUADRANT, FIRE CONTROL, M18 11729525 (19200)	1



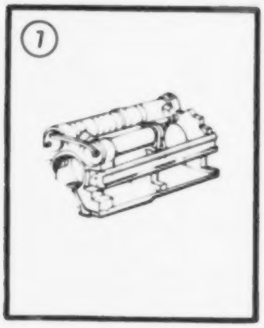






INTEGRAL COMPONENTS OF END ITEM—Continued

ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
7	1025-01-094-3333	RECOIL MECHANISM, M45 12007800 (19200)	1
7.1	5305-00-928-2367	SETSCREW, SOCKET HEAD MS51021-86 (96906)	2
8	1240-01-038-0530	TELESCOPE, ELBOW, M138 11741626 (19200)	1
9	1240-01-038-0531	TELESCOPE, PANORAMIC, M137 11741101 (19200)	1
10	5610-00-595-6057	WASHER, FLAT MS15795-815 (96906)	4
11	5310-00-973-8786	WASHER, LOCK MS35338-142 (96906)	4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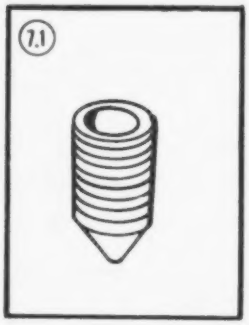
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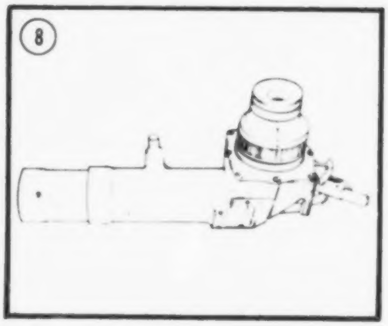
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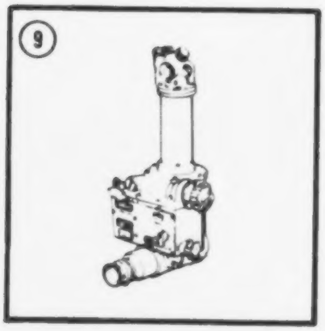
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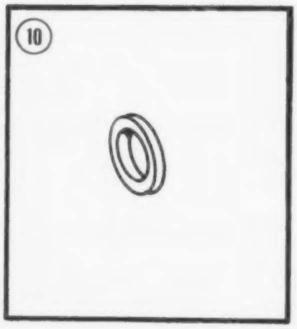
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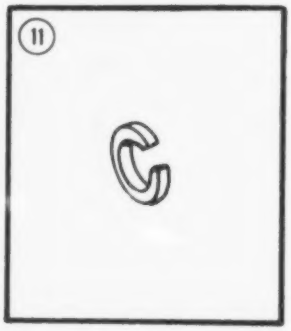
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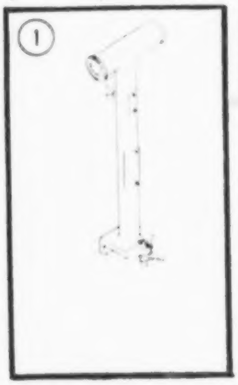
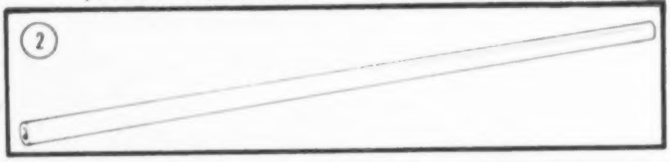
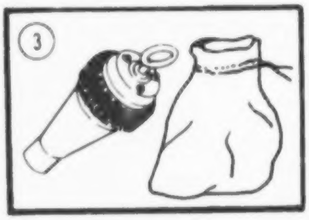
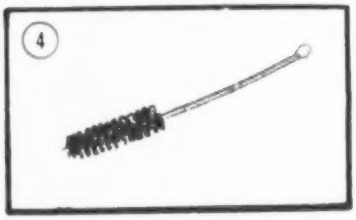
Section III. BASIC ISSUE ITEMS

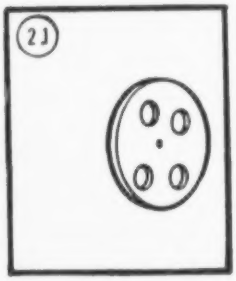
ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
1	4931-01-048-5834	ALINEMENT DEVICE, M139 11741648-1 (19200)	1
2	5120-00-617-0995	BAR, WEAPONS HANDLING 6170995 (19204)	2
2.1	4933-01-152-2902	BORESIGHT, BREECH 10544480 (19200)	1
3	1025-01-196-2176	BRUSH AND BAG ASSEMBLY 155-110-401 (27412)	1
4	4933-00-730-7183	BRUSH, CLEANING, PRIMER 7307183 (19206)	1
5	1025-01-210-3671	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL 12009266 (19200)	1
6	1025-01-114-0059	CASE, FIRING MECHANISM 9332579 (19200)	

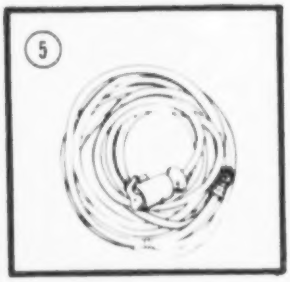


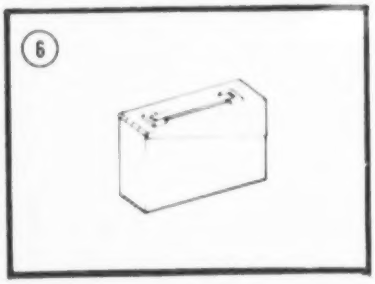












BASIC ISSUE ITEMS—Continued

ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
7		Deleted.	
8	1240-01-040-6977	CASE, TELESCOPE 11746386 (19200)	1
8.0	1025-01-232-6822	**CHAMBER SWAB** **155CS (27412)**	1
8.1	1240 00 654 6089	**CHEST, OPTICAL SPOTTING** **6546089 (19200)**	1
9	4933-00-601-9667	CLEANING TOOL, VENT 6019667 (19206)	1
10	1240-00-332-1780	COLLIMATOR, INFINITY AIMING REFERENCE, M1A1 10556235 (19200)	1
11	1290-00-653-7993	COVER, AIMING POST, M401 6537993 (19200)	1
12		**Deleted.**	
13	1025-01-038-6060	COVER, BREECH 11578964 (19206)	1

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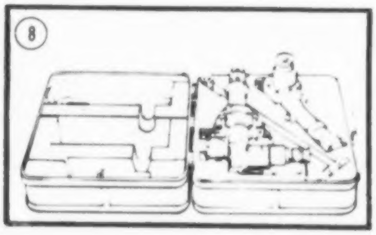

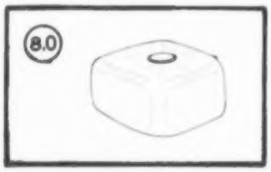

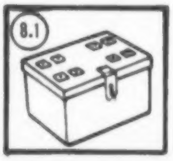

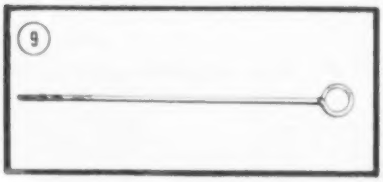

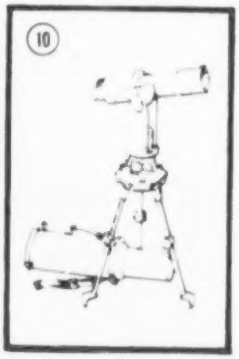

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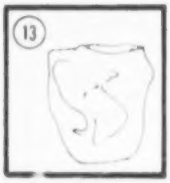

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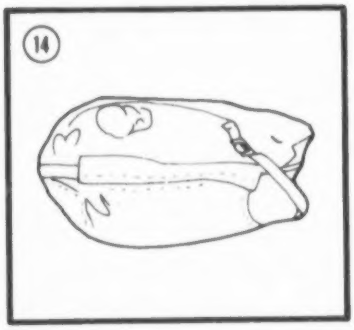
BASIC ISSUE ITEMS—Continued

ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
14	1240-01-042-7989	COVER, FIRE CONTROL 11729566 (19200)	2
14.1		Deleted.	
14.2	5120-00-227-8079	EXTENSION, SOCKET WRENCH: 16 in. (40.64 cm) lg L122 (55719)	1
14.3	1025-01-082-3586	EXTRACTOR TOOL ASSEMBLY FOR PROJECTILE M712 AND M823 9305465 (19200)	1
15	1025-00-895-9182	FIRING MECHANISM ASSEMBLY 8767203 (19206)	1
15.1	1025-01-031-7194	FIRING MECHANISM BLOCK ASSEMBLY 11578909 (19206)	1



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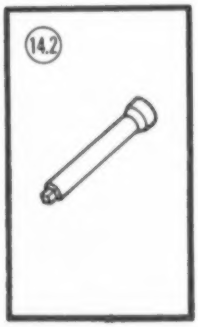
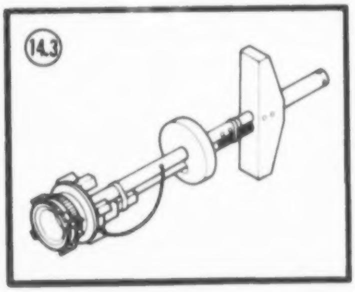
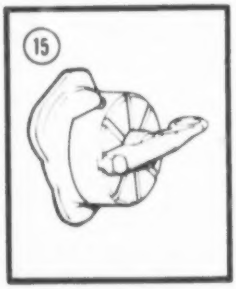
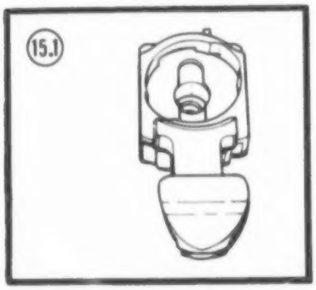


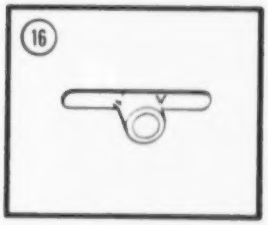






BASIC ISSUE ITEMS—Continued

ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
16	1290-00-764-7761	FUZE SETTER, M27 7647761 (19200)	1
17	1290-00-078-4367	FUZE SETTER, M34 SK87038 (19200)	1
18	1290-00-201-3507	FUZE SETTER, M35 11729019 (19200)	1
19	5120-00-265-7462	HAMMER, HAND: 6 lb GGG-H-86 (81348)	1
20	5120-00-288-6574	HANDLE, MATTOCK-PICK 11677021 (19207)	1
21	5120-00-236-7590	HANDLE, SOCKET WRENCH GGG-W-641 (81348)	1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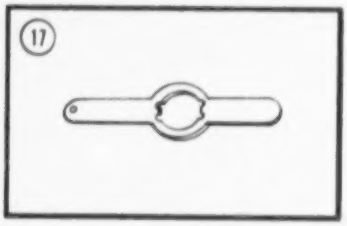
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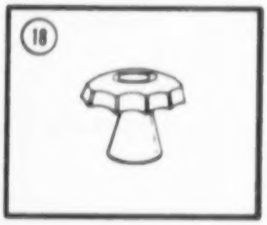
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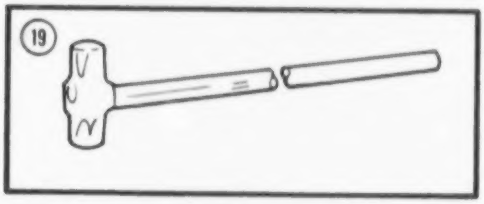
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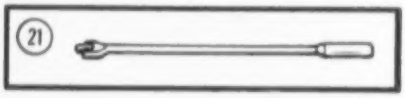
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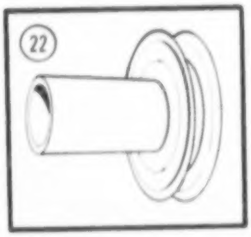
BASIC ISSUE ITEMS—Continued

ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
22	1030-00-859-4511	HOLDER, CHAMBER SWABBING SPONGE 8765688 (19206)	1
23	1095-00-600-6780	LANYARD, FIRING (6-FOOT LENGTH) 6006780 (19206)	1
23.0	1095-01-129-4672	LANYARD, FIRING (25-FOOT LENGTH) 11579739 (19206)	1
23.1	1290-01-148-4821	LIGHT, AIMING POST, M14 11785401 (19200)	2
24		Deleted	
25		Deleted	
26		Deleted	
27	4930-00-250-8038	LUBRICATING GUN, HAND MIL-G-3859 (81349)	1
28	5120-00-243-2395	MATTOCK A-A-315 (58536)	1
29	4930-00-537-8977	OILER, HAND GGGO591 (81348)	1
29.1		OPERATOR'S MANUAL (TM 9-1025-211-10)	1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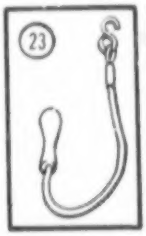
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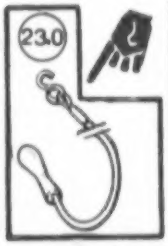
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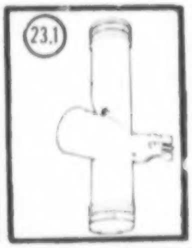
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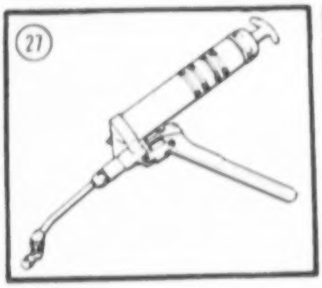
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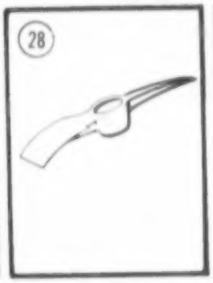
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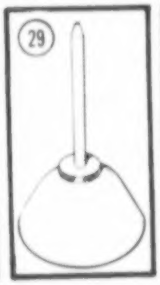
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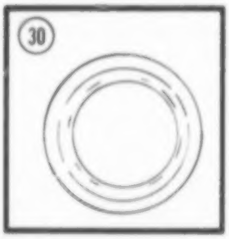
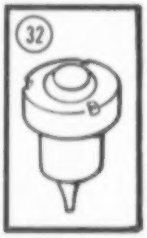
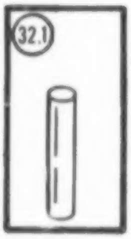
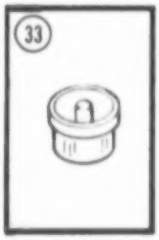
BASIC ISSUE ITEMS—Continued

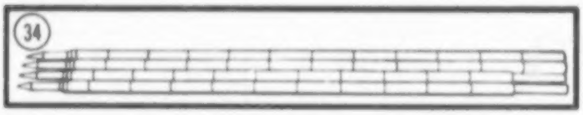
ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
30	1025-01-012-8271	PAD, OBTURATOR 11578862 (19206)	1
31	7240-00-160-0455	PAIL, UTILITY RR-P-35 (81348)	1
32	1025-01-038-5608	PIN, FIRING 11578911 (19206)	1
32.1	5315-01-033-5417	PIN, GROOVED HEADLESS 11579233 (19206)	1
33	1025-00-566-3789	PLUG, MUZZLE 7309257(19206)	1
34	1290-00-535-7617	POST, AIMING, M1A2 7687114 (19200)	2
35	1290-00-169-1937	QUADRANT, FIRE CONTROL, GUNNER'S, M1A2 11732246 (19200)	1
36	1025-00-860-5443	RAMMER, ARTILLERY 8767210 (19206)	1
37	1030-00-730-7416	RAMMER, LOADING 7307416 (19206)	1

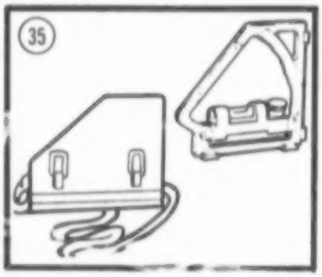


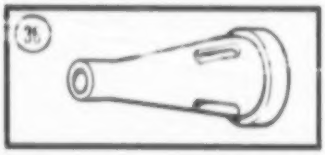


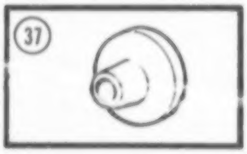






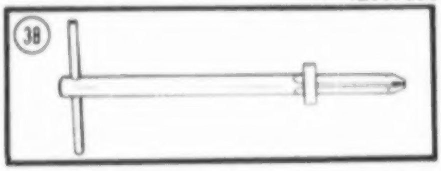


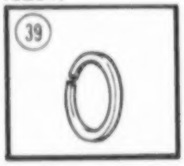


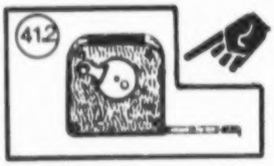


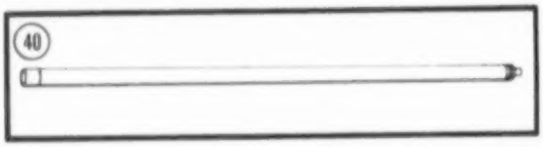
BASIC ISSUE ITEMS—Continued

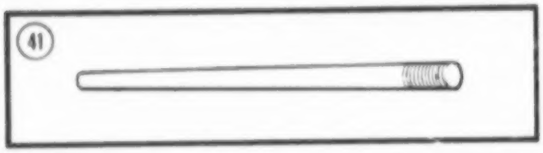
ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
38	4933-00-226-6129	REAMER ASSEMBLY 8769912 (19206)	1
39	1025-01-038-1192	RING, SPLIT, FRONT 11578961 (19206)	1
40	1025-00-563-7232	STAFF SECTION, CLEANING, ARTILLERY (4-FOOT) 7309228 (19206)	8
41	1025-01-044-2587	STAFF SECTION, CLEANING, ARTILLERY (2-FOOT) 11579227 (19206)	1
41.1	6220-01-213-2430	TAILLIGHT, VEHICULAR 12009284 (19200)	1
41.2	5210-00-081-4719	TAPE, MEASURING GGG-T-106 (81348)	1
42	1025-01-038-7220	TRAY, LOADING, AMMUNITION 12008946 (19204)	1
43	4710-01-038-3067	TUBE, METALLIC 12007803 (19204)	2

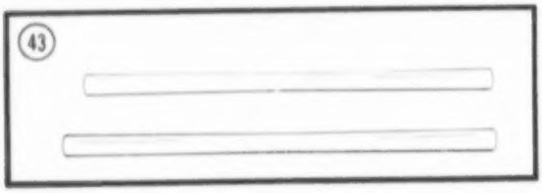


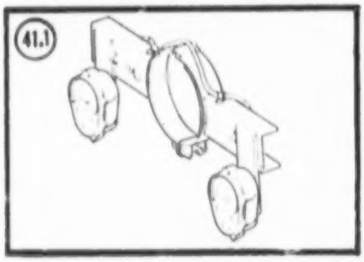


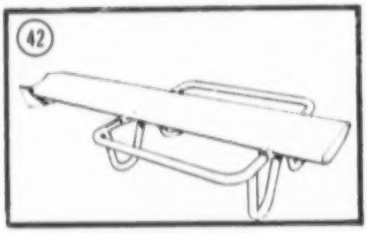










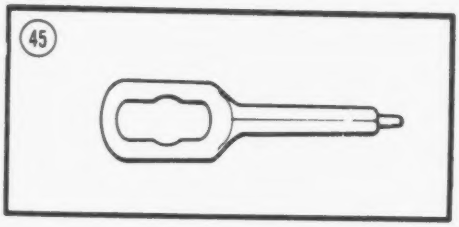


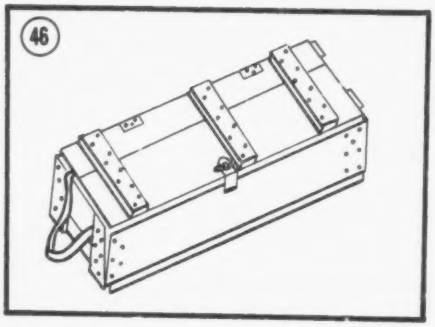
BASIC ISSUE ITEMS—Continued

ILLUS NO.	NATIONAL STOCK NO.	DESCRIPTION PART NO. & FSCM	QTY FURN
44		Deleted.	
45	4933-00-723-1161	WRENCH, FUZE-SETTER, COMBINATION, M18 7231161 (19206)	1
46	1025-01-174-3990	BOX, PACKING for EXTRACTOR TOOL ASSEMBLY for PROJ M712 and M823. 9331729 (19200)	1

44

Deleted.





APPENDIX C
ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. SCOPE

This appendix lists additional items you are authorized for the support of the M198 howitzer.

C-2. GENERAL

This list identifies items that do not have to accompany the M198 howitzer and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. EXPLANATION OF LISTING

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment.

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER & FSCM	USABLE ON CODE	(3) U/M	(4) QTY AUTH
1025-00-860-5446	BELT, PRIMER 8767215 (19206)		EA	V
8020-00-262-9099	BRUSH, ARTIST'S H-B-118 (81348)		EA	V
7920-00-291-5815	BRUSH, WIRE, SCRATCH H-B-178 (81348)		EA	V
5140-00-653-4198	CHEST, TOOL 6534198 (19204)		EA	V
5110-00-156-0054	FILE, HAND GGG-F-325 (81348)		EA	V
5120-00-061-8543	HAMMER, HAND GGG-H-86 (81348)		EA	V

ADDITIONAL AUTHORIZATION LIST—Continued

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(3) U/M	(4) QTY AUTH
5110-00-263-0349	HANDLE, FILE, WOOD NN-H-00106 (81348)	EA	V
5120-00-223-7397	PLIERS, SLIP-JOINT GGG-P-00471 (81348)	EA	V
5120-00-278-1283	SCREWDRIVER, FLAT-TIP GGG-S-121 (81348)	EA	V

APPENDIX D
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the M198 howitzer. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

D-2. EXPLANATION OF COLUMNS

a. **Column 1—Item Number.** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, (item 5, app D)").

b. **Column 2—Level.** This column identifies the lowest level of maintenance that requires the listed item.

C—Operator/Crew

c. **Column 3—National Stock Number.** This is the National stock number assigned to the item; use it to request or requisition the item.

d. **Column 4—Description.** Indicates the National item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. **Column 5—Unit of Measure (U/M).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	C	8105-00-269-4662	BAG, PLASTIC: waterproof and greaseproof MIL-B-117D (81349) 20 x 25, std pkg 100	EA
1.0	C	9150-01-059-2586 9150-01-102-9455	BRAKE FLUID, SILICONE, AUTOMOTIVE (BFS) MIL-B-46176 (81348) 1 gal (3.79 l) metal container 1 gal (3.79 l) plastic container	CN CN
1.0.1	C	7510-00-223-6701	CHALK, MARKING SS-C-255 (81348) Gross (144)	EA
1.1	C	9150-01-053-6688 9150-01-054-6453	CLEANER, LUBRICANT AND PRESERVATIVE: grade 2 (CLP) MIL-L-63460 (81349) 1-gal. bottle 1-pt can	GL CN
2	C	6850-00-597-9765	CLEANING COMPOUND: liquid form MIL-C-18718 (81349)	GL
3	C	6850-00-227-1887	CLEANING COMPOUND, OPTICAL LENS MIL-C-43454 (81349) 1 qt	QT
4	C	6850-00-224-6663	CLEANING COMPOUND: rifle bore cleaner (RBC) MIL-C-372 (81349) 1-gal can	CN
5	C	5350-00-268-3116 5350-00-221-0872	CLOTH, ABRASIVE: crocus P-C-458 (81348) 2 wide x 50 yd 9 x 11 sh, 50 sh sleeves	EA EA
6	C	8305-00-222-2423	CLOTH, CHEESECLOTH: cotton CCC-C-440 (81348)	YD
7	C	4020-00-242-4072	CORD, FIBROUS: 0.045 diam, natural MIL-C-7515 (81349)	LB

EXPENDABLE SUPPLIES AND MATERIALS LIST—Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
8	C		CUSHIONING MATERIAL MIL-P-26514, type I, class II (81348)	
		8135-00-052-9070	48 x 24 x 4	SH
9	C		GREASE, AIRCRAFT: general purpose (GPG) wide temperature range (WTR) MIL-G-81322 (81349)	
		9150-00-944-8953	1 lb	LB
		9150-00-935-5851	5 lb	LB
		9150-00-181-7724	8 oz	TU
9.1	C		HYDRAULIC FLUID, PETROLEUM BASE PRESERVATIVE: (OHT) MIL-H-6083C (81348)	
		9150-00-935-9807	1 qt (0.95 l) container	CN
		9150-00-935-9808	1 gal (3.79 l) container	CN
9.2	**C**	**1025-01-196-2172**	**KIT, ARTILLERY CLEANING SK184J5 (59678)**	**EA**
10	C		LACQUER, ACRYLIC: camouflage, lusterless MIL-L-52909, type II (81348)	
		8010-01-070-0922	1-pt can	CN
11	C		LUBRICATING OIL, GENERAL PURPOSE: special preservative (PL S) VV-L-800 (81348)	
		9150-00-231-6689	1 qt	QT
		9150-00-231-9062	5 gal	GL
11.1			**Deleted.**	
12	C	6640-00-663-0832	PAPER, LENS: tissue sheet NNN-P-40, type 1 (81348)	EA
12.1	C	8010-00-935-7080	PRIMER COATING, MIL-P-23377 (81349)	KT
13	C		RAG, WIPING: cotton DDD-R-30 (81348)	
		7920-00-205-1711	50 lb	BE
14	C		SOAP, TOILET: liquid P-S-624 (81348)	
		8520-00-228-0598	6 gal	CN

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST—Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
14.1	C	6685-00-678-5736	THERMOMETER, SELF-INDICATING by metallic, MIL-T-3618C (81349)	EA
			NOTE Items 15 through 20 are applicable to the Loose Projectile Restraint System (LPRS) only.	
15	C	2590-01-223-2944	DIVIDER, AMMUNITION (LONG: (LPRS)), 155mm, AC200000403 (28620)	EA
16	C	2590-01-223-2945	DIVIDER, AMMUNITION (SHORT: (LPRS)), 155mm, AC200000402 (28620)	EA
17	C	2590-01-223-2949	RACK, AMMUNITION, STOWAGE 15 round, (LPRS), 155mm AC200000400 (28620)	EA
18	C	5340-00-980-9277	STRAP, WEBBING: 1.75 in. w., 10900880 (19207)	EA
19	C	5340-01-089-4997	STRAP, WEBBING, 11669588 (19207)	EA
20	C	1670-00-725-1437	TIE DOWN, CARGO, AIRCRAFT: nylon, 1.719 in. w., type CGU1B MIL-T-27260 (81349)	EA

APPENDIX E
STOWAGE AND SIGN GUIDE FOR COMPONENTS OF END ITEM, BASIC ISSUE ITEMS, AND APPLICABLE ADDITIONAL AUTHORIZATION LIST ITEMS

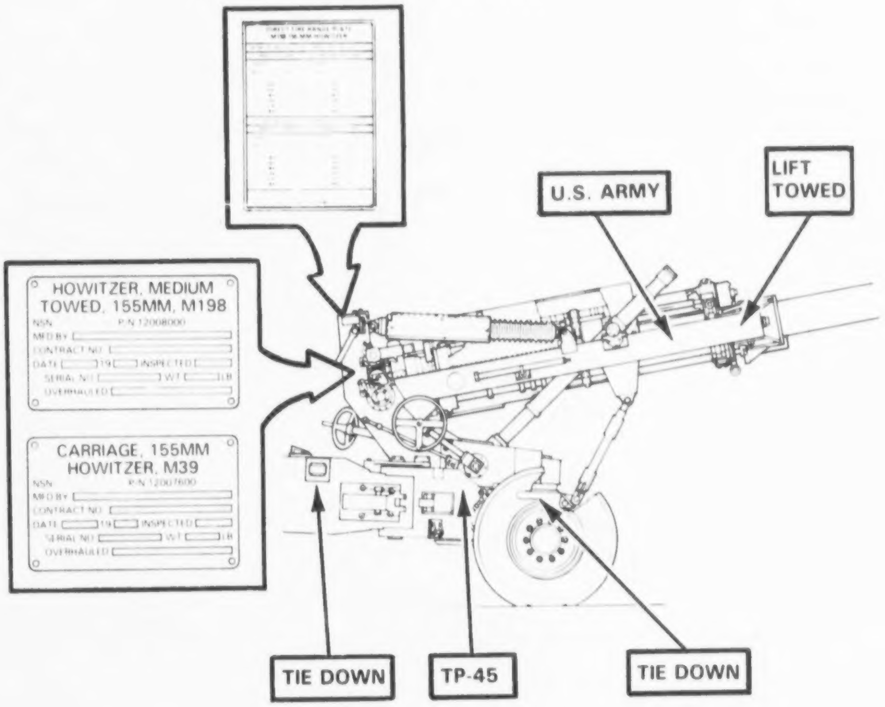
E-1. SCOPE

This appendix shows the locations for stowage of equipment and materiel required to be carried on the M198 howitzer.

E-2. GENERAL

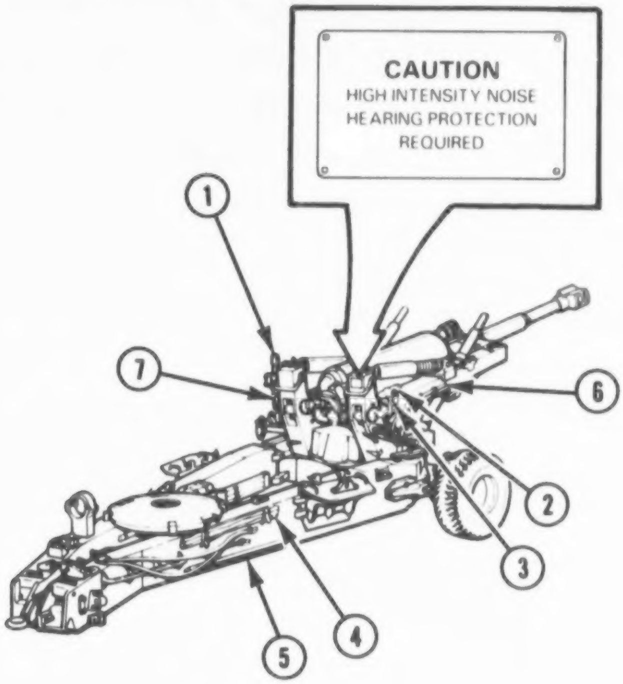
Locations of components of end item which remain attached to the M198 howitzer during operation and storage are shown on pages 1-7 thru 1-11. Other components of end item and basic issue items mounted or stowed on the M198 howitzer are shown in this appendix. Items not shown are stowed in the prime mover or the ammunition truck. Additional authorization list items are stowed at the discretion of the chief of section.

STOWAGE AND SIGN GUIDE


U.S. ARMY
LIFT TOWED
HOWITZER, MEDIUM TOWED, 155MM, M198
NSN P/N 12008000
MFD BY
CONTRACT NO
DATE 19 INSPECTED
SERIAL NO WT LB
OVERHAULED
CARRIAGE, 155MM HOWITZER, M39
NSN P/N 12007600
MFD BY
CONTRACT NO
DATE 19 INSPECTED
SERIAL NO WT LB
OVERHAULED
TIE DOWN
TP-45
TIE DOWN

RIGHT SIDE VIEW

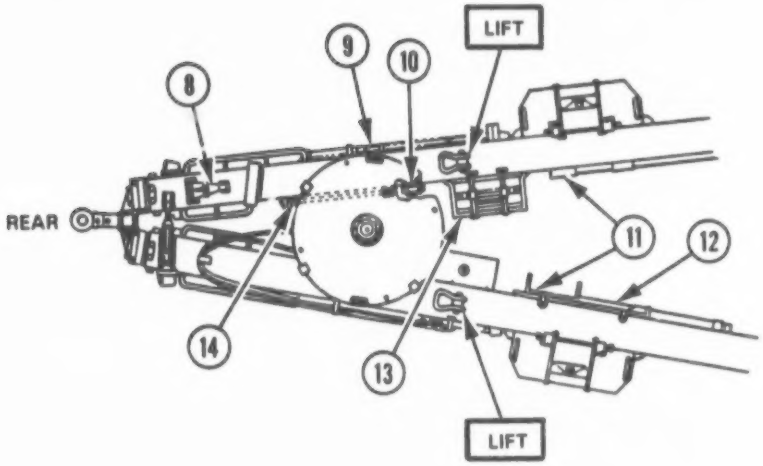
STOWAGE AND SIGN GUIDE – Continued


CAUTION
HIGH INTENSITY NOISE
HEARING PROTECTION
REQUIRED
1
7
6
2
3
4
5

RIGHT SIDE VIEW

NO.	STOWAGE PLAN ITEM
1	M137 Panoramic Telescope
2	M138 Elbow Telescope
3	M172 Telescope and Quadrant Mount M18 Fire Control Quadrant
4	M1A2 Aiming Posts M401 Aiming Post Cover
5	Weapons Handling Bars
6	Metallic Tubes (Pump Handles)
7	M171 Telescope and Quadrant Mount

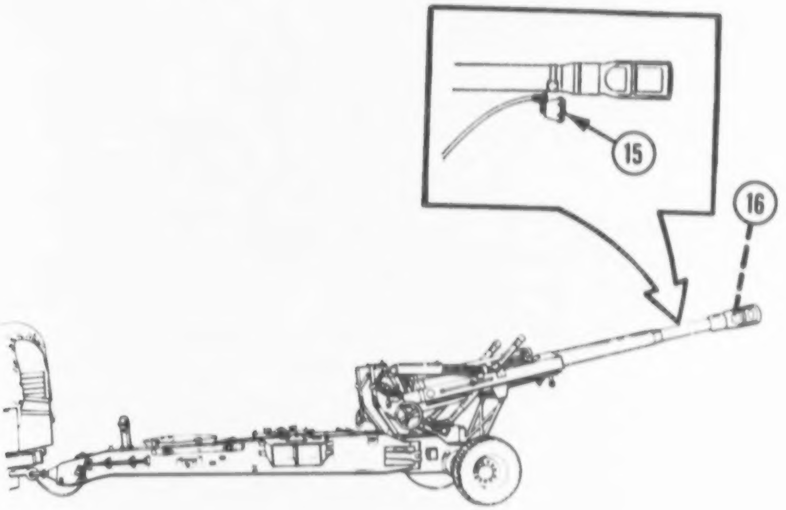
STOWAGE AND SIGN GUIDE—Continued



TOP VIEW

NO.	STOWAGE PLAN ITEM
8	Artillery Rammer (Bell Rammer)
9	Hand Hammer
10	Loading Rammer
11	Cleaning Staff Sections
12	Ammunition Loading Tray
13	Telescope Carrying Case M139 Alinement Device
14	Mattock with Handle

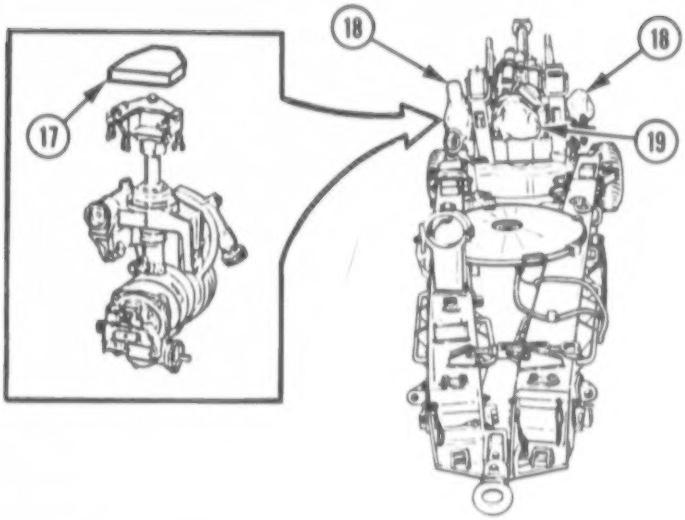
STOWAGE AND SIGN GUIDE – Continued



RIGHT SIDE VIEW

	STOWAGE PLAN
NO.	ITEM
15	Vehicular Taillight Special Purpose Cable Assembly
16	Muzzle Plug

STOWAGE AND SIGN GUIDE—Continued



REAR VIEW

NO.	STOWAGE PLAN ITEM
17	Protective Cover
18	Fire Control Covers
19	Breech Cover

ALPHABETICAL INDEX

Subject **Page**

A

Abbreviations, list of 1-4

ADAM HE projectile:
  M692 .... 4-12.1
  M731 .... 4-12.1

Adapter assembly:
  Inspection 3-72
  Maintenance 3-72

Additional authorization list: C-1
  Explanation of listing C-1
  General C-1
  Scope C-1

Adjustment (See individual part)

After firing 4-37

Agent, projectile, H or HD, M110 4-9

Aiming circle, M2 (See M2 aiming circle)

Aiming post light, M14 (See M14 aiming post light)

Aiming post, M1A2 (See M1A2 aiming post)

Alinement (See individual part)

Alinement device, M139 (See M139 alinement device)

Alinement test of M171 telescope and quadrant mount and M137 pantel 3-87

Alinement tests and measurements, fire control 3-78

Ammunition: 4-1
  After firing 4-37
  Authorized fuzes 4-14
  Authorized projectile and fuze combinations 4-5
  Authorized projectile and propelling charge combinations 4-6
  Authorized projectiles 4-4
  Care 4-45
  Destroying powder increments 4-48.1
  Flash reducer, M2 4-21
  Foreign (NATO) 5-1
  Fuze, fuze-setting tools, and procedures 4-30

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ALPHABETICAL INDEX—Continued

Subject — Page

Ammunition:—Continued
- Fuze setting 4-30
- Fuzes 4-26
- General 4-1
- Handling 4-45
- Identification 4-2
- Loading and firing 4-36
- Maintenance 4-45
- Misfire and checkfire procedures 4-39
- Model numbers and color coding of projectiles 4-3
- Packing and unpacking 4-21
- Preparation for firing 4-21
- Prepared for firing, but not fired 4-38
- Primer, M82 .... 4-20.2
- Problems in extreme hot weather 2-115
- Propelling charge preparation 4-22
- Propelling charges 4-19
- Storage 4-49
- Unserviceable 4-48
- (See also specific item)

Ammunition or components of ammunition prepared for firing, but not rammed, maintenance 4-48

Angle drive unit (elevating) (See Elevating angle drive unit)

Antenna mounting bracket, M90 chronograph 1-11

Assistant gunner:
- Duties, direct fire missions 2-94

Authorized fuzes: 4-14
- Mechanical time and superquick:
  - M501A1 and M501 4-15
  - M564 4-16
  - M577 and M582 4-17
- Mechanical time, M565 4-16
- Point-detonating:
  - Concrete-piercing, M78 and M78A1 and booster, M25 .... 4-14.1
  - DM211 (GE and NO) 5-6
  - M557C1 (NL) 5-6
  - M572 .... 4-14.1
  - M557 .... 4-14.1
  - M739 or M739A1 4-15
- Proximity, variable time:
  - M728 4-17
  - M732 4-18

Authorized projectiles: 4-4
- Agent, H or HD, M110 4-9
- Gas:
  - Nonpersistent, GB, M121A1 4-10
  - Persistent, VX, M121A1 4-9

Subject — Page

- HE:
  - ADAM:
    - DM21 (GE) 5-4
    - M692 .... 4-12.1
    - M731 .... 4-12.1
  - M107 4-9
    - M107 (normal and deep cavity) 5-5
    - M107C1 (NL) 5-5
  - RAAMS:
    - M718 .... 4-12.2
    - M741 .... 4-12.2
- HEAT, M712 (Copperhead) 4-13
- HERA, M549 and M549A1 4-11
- ICM:
  - M449 series 4-12
  - M483A1 4-12
- Illuminating, M485A1 and M485A2 4-11
- Practice, M804 4-14
- Smoke:
  - HC, M116 and M116B1 4-10
  - HC, M116A1 4-10
  - WP:
    - M110 and M110E1 4-10
    - M110A1 (M110E2) and M110A2 (M110E3) 4-10
    - M825 4-13
- Table 4-5
- Training, M823 (Copperhead) 4-13

Axle:

- PMCS:
  - Daily 2-31
  - Weekly 2-45

B

Ball screw assembly (See Elevating screw assembly)

Baseplate, firing (See Firing baseplate)

Basic issue items B-4

Battery computer system (BCS) gun assembly 2-94.2

BCS gun assembly GA bracket 1-9

Bearing unit housing:

- Maintenance 3-56
- Servicing 3-56

Block assembly, firing mechanism (See Firing mechanism block assembly)

Booster, M25 (See M25 booster)

Bore and chamber, PMCS 2-14

ALPHABETICAL INDEX—Continued

Subject	Page
Boresight alinement of M137 pantel, checking, using M139 alinement device	2-77
Boresighting M138 elbow telescope using distant aiming point	2-79
Bottom carriage:	
Controls and indicators	2-4
Inspection	3-60
Maintenance	3-60
PMCS	2-29
Servicing	3-61
Bracket, antenna mounting, M90 chronograph	1-11
Bracket, gun assembly (GA), battery computer system (BCS) gun assembly	1-9
Brake fluid level, checking	3-70
Brake head assembly:	
Inspection	3-69
Maintenance	3-69
(See also Brakes)	
Brake, muzzle (see Muzzle brake)	
Brakes, troubleshooting	3-27
Break periods during training or firing:	
At drill	1-20
When firing	1-20
Breech counterbalance:	
Inspection	3-47
Maintenance	3-47
Servicing	3-47
Breech mechanism assembly:	
Inspection	3-33
Maintenance	3-33
PMCS:	
Daily	2-17
Weekly	2-42
Repair	3-33
Servicing	3-33
Troubleshooting	3-21

Subject Page

Breechblock assembly:
  Controls and indicators 2-1
  Inspection 3-48
  Installation 3-48
  Maintenance 3-47
  Removal 3-47
  Servicing 3-48
  Troubleshooting 3-20

C

Cannon (See M199 cannon)

Care of ammunition 4-45

Carriage (See M39 carriage)

Chamber, PMCS 2-14

Charges, propelling (See Propelling charges) (See also specific model number)

Chart, metric Inside back cover

Checking:
  Brake fluid level 3-70
  Hydraulic fluid level 3-66

Checking boresight alinement of M137 pantel, using M139 alinement device 2-77

Checks, prefiring 2-82

Chief of section, duties:
  During direct fire missions 2-93
  During usual conditions 2-53

Chronograph, M90 2-94.2

Clutch, friction (See Friction clutch)

Cold tube misfire procedures 4-42

Collimator (See M1A1 collimator)

Color coding of projectiles 4-3

Commands, section drill (See Break periods during training or firing or Preliminary commands and formations to form the section)

Common name 1-1

Comparison test, M139 alinement device 3-89

Components of end item list: B-1
  Basic issue items B-4
  Explanation of columns B-1
  General B-1
  Integral components of end item B-2
  Scope B-1

Controls and indicators 2-1

ALPHABETICAL INDEX—Continued

Subject **Page**

Counterbalance, breech (See Breech counterbalance)

- Cradle assembly:
  - Inspection 3-56
  - Maintenance 3-56
  - Servicing 3-56

Crew, duties 2-53

D

Daily preventive maintenance checks and services 2-13

Damp atmosphere 2-116

Data, performance 1-12

Deep-cavity projectiles 4-27, 5-5

Definitions of terms 1-6

Demolition of materiel to prevent enemy use 6-1

Description of major components 1-7

- Destruction of equipment:
  - Fire control equipment 6-2
  - M199 cannon and M39 carriage: 6-2
    - Burning 6-3
    - Demolition charges 6-2
    - Gunfire 6-4
  - Pneumatic tires: ....
    - Incendiary grenades 6-4
    - Slashing 6-4

Destruction of powder increments 4-48.1

- Detent assembly:
  - Inspection 3-67
  - Maintenance 3-67
  - Servicing 3-67

Direct fire range plate 2-93

Disassembly (See individual part)

DM21 HE 155-mm projectile (GE) 5-4

Subject | Page

DM211 point-detonating fuze (GE and NO) 5-6

DM42B1 propelling charge (GE) 5-7

DM62 propelling charge (GE) 5-7

Drill, reduced crew 1-20

Drill, section 1-15

E

EIR's 1-1

Elbow telescope, M138 (See M138 elbow telescope)

Elevating angle drive unit:
  Inspection 3-57
  Maintenance 3-57

Elevating handwheel:
  Controls and indicators 2-2
  Inspection 3-57
  Maintenance 3-57

Elevating mechanism, PMCS 2-27

Elevating screw assembly:
  Inspection 3-57
  Maintenance 3-57
  Servicing 3-58

Emergency hose assembly:
  Inspection 3-70
  Maintenance 3-70
  PMCS 2-30

Emergency procedures 2-119

Emplacing howitzer 2-54

Emplacing M1A1 collimator 2-72

Emplacing M1A2 aiming posts 2-74

End-for-end test 3-79

EOD personnel, notification of misfire/checkfire 4-41

Equilibrator cylinders:
  Adjustment 3-55
  Maintenance 3-54
  PMCS 2-26

ALPHABETICAL INDEX—Continued

Subject **Page**

Equilibrators:
  Problems in extreme cold weather 2-114
  Problems in extreme hot weather 2-115
  (See also Equilibrator cylinders)

Equipment improvement recommendations, reporting 1-1

Equipment logbook, PMCS:
  Daily 2-13
  Weekly 2-42

Equipment purpose, capabilities, and features 1-7

Errors, reporting i

Excess explosive components, maintenance 4-48

Expendable supplies and materials list: D-2
  Explanation of columns D-1
  Scope D-1

Explosive components, excess, maintenance 4-48

Expulsion charge assembly:
  Installation 4-38
  Preparation for firing, removal 4-24

Extractor assembly operation 4-57

Extreme cold weather conditions 2-114

Extreme hot weather conditions 2-115

F

Fire control alinement tests and measurements: 3-78
  Alinement test of M171 telescope and quadrant mount and M137 pantel 3-87
  Frequency 3-78
  Leveling trunnions 3-81
  M139 alinement device comparison test 3-89
  Purpose 3-78
  Reliability test of M137 panoramic telescope 3-86
  Test of gunner's quadrant:
    End-for-end test 3-79
    Micrometer test 3-78
  Testing M17 and M18 fire control quadrants 3-82

Subject Page

Fire control equipment:
  Destruction of 6-2
  Operation under unusual conditions 2-114
  Maintenance 3-73
  PMCS :
    Daily 2-32
    Weekly 2-47
  Troubleshooting 3-29

Fire control mounting adapter (See Adapter assembly)

Fire control quadrant, M17 (See M17 fire control quadrant)

Fire control quadrant, M18 (See M18 fire control quadrant)

Firing:
  Direct fire missions 2-92
  Indirect fire missions 2-83

Firing ammunition 4-36

Firing base ball, PMCS 2-29

Firing baseplate:
  Emplacing 2-59
  Inspection 3-67
  Maintenance 3-67
  PMCS 2-29
  Servicing 3-67
  Stowage 2-103

Firing mechanism:
  Disassembly 3-35
  Inspection 3-37
  Installation 3-40
  Maintenance 3-34
  Reassembly 3-37
  Removal 3-34
  Servicing 3-37
  Testing 3-34
  Troubleshooting 3-17

Firing mechanism block assembly:
  Disassembly 3-41
  Inspection 3-41
  Installation 3-42
  Maintenance 3-40
  Reassembly 3-42
  Removal 3-40
  Servicing 3-41

ALPHABETICAL INDEX – Continued

Subject Page

Firing mechanism housing assembly:
  Inspection . . . 3-43
  Maintenance . . . 3-43
  Servicing . . . 3-43

Firing, preparation . . . 4-21

Flash reducer, M2 . . . 4-21

Foreign ammunition (NATO) . . . 5-1

Fording operations:
  After fording . . . 2-117
  Deep-water fording . . . 2-117

Formations (See Preliminary commands and formations to form the section)

Forms, maintenance . . . 1-1

Frequency of fire control alinement tests . . . 3-78

Friction clutch:
  Inspection . . . 3-58
  Maintenance . . . 3-58

Front yoke assembly:
  Troubleshooting . . . 3-21
  (See also Recoil yoke assembly (front))

Fuze and projectile combinations, authorized . . . 4-5

Fuze assembly, preparation for firing . . . 4-28

Fuze, fuze-setting tools, and procedures . . . 4-30

Fuze procedures . . . 4-30

Fuzes:
  Authorized . . . 4-14
  Authorized (NATO) . . . 5-6
  Maintenance . . . 4-47
  Point-detonating:
    DM211 (GE and NO) . . . 5-6
    M557C1 (NL) . . . 5-6
  Preparation for firing . . . 4-21
  (See also specific model number)

Fuze-setter wrench, M18 . . . 4-28

Subject	Page
Fuze setting:	4-30
M501 series	4-35
M557, M572, and M739	4-30
M565 and M564	4-31
M577 series and M582 series	4-33
M728 and M732	4-31
Sequence	4-34
Tools	4-30

G

Subject	Page
Gas projectile:	
Nonpersistent, GB, M121A1	4-10
Persistent, VX, M121A1	4-9
GB nonpersistent gas projectile, M121A1	4-10
General information	1-1
Guide assembly:	
Maintenance	3-56
Servicing	3-56
Guide, stowage and sign	E-1
Gun assembly (BCS)	2-94.2
Gun assembly (GA) bracket	1-9
Gun tube (See Tube)	
Gun tube travel lock:	
Inspection	3-71
Maintenance	3-71
Servicing	3-71
Gunner, assistant (See Assistant gunner)	
Gunner, duties, direct fire missions	2 94.1
Gunner's quadrant, test	3-78

H

Subject	Page
H or HD agent projectile, M110	4-9
Hand receipt	1-6
Handbrakes:	
Inspection	3-68
Maintenance	3-68
Releasing	2-101
Servicing	3-68

ALPHABETICAL INDEX—Continued

Subject **Page**

Handbrakes:—Continued
  Setting 2-55

Handling of ammunition 4-45

HC projectile, smoke:
  M116 and M116B1 4-10
  M116A1 4-10

HE projectile:
  ADAM:
    M107 4-9
    M692 .... 4-12.1
    M731 .... 4-12.1
  DM21 (GE) 5-4
  M107 (normal and deep cavity) 5-5
  M107C1 (NL) 5-5
  RAAMS:
    M718 .... 4-12.2
    M741 .... 4-12.2

HEAT projectile, M712 4-13

Handwheel (elevating) (See Elevating handwheel)

Handwheel (traversing) (See Traversing handwheel)

Hearing Protection .... b

HERA projectile, M549 and M549A1 4-11

Hose assembly, emergency (See Emergency hose assembly)

Hose assembly, service (See Service hose assembly)

Housing assembly, firing mechanism (See Firing mechanism housing assembly)

Hot, damp, and salty atmosphere 2-116

Hot tube misfire procedures 4-44.1

How to use this manual iii

Howitzer, M198 (See M198 howitzer)

Hydraulic fluid level, checking 3-66

Hydraulic pumps:
  Inspection 3-65
  Maintenance 3-65

Subject **Page**

Hydraulic pumps:—Continued
  Servicing 3-65
  Testing 3-65

I

ICM projectile:
  M449 series 4-12
  M483A1 4-12

Identification of ammunition 4-2

Illuminating projectile, M485A1 and M485A2 4-11

Improvements, recommending i

Increments, powder, destroying 4-48.1

Indicators 2-1

Inspection (See individual part)

Installation (See individual part)

Integral components of end item B-2

L

Laying for direction and elevation:
  Direct fire missions 2-92
  Indirect fire missions 2-83

Laying the howitzer, using M2 aiming circle 2-68

Left trail (See Trail (left))

Leveling trunnions 3-81

Lifting plug removal, preparation for firing 4-26

Light aiming post (See M14 aiming post light)

List of abbreviations 1-4

Lists:
  Abbreviations 1-4
  Additional authorization C-1
  Expendable/durable supplies and materials D-2
  Integral components of end item B-2
  Nomenclature cross-reference 1-1

ALPHABETICAL INDEX—Continued

Subject	Page
Loading ammunition	4-36
Loading and firing:	
Direct fire missions	2-92
Indirect fire missions	2-83
Location and description of major components	1-7
Locking assembly:	
Inspection	3-68
Maintenance	3-68
Servicing	3-68
Logbook, equipment (See Equipment logbook)	
Loose Projectile Restraint System (LPRS)	4-65
Lubrication instructions	3-1
M	
Maintenance forms and records	1-1
Maintenance procedures (See also individual assemblies)	3-31
Maintenance of ammunition	4-45
Major components, location and description of	1-7
Manifold assembly:	
Controls and indicators	2-5
Inspection	3-65
Maintenance	3-65
Manual brake assembly (See Handbrakes)	
Materials, expendable/durable	D-1
Maximum firings per day with hearing protection required	2-89
Measurements, fire control	3-78
Mechanical time and superquick fuze:	
M501A1 and M501	4-15
M564	4-16
M577 and M582	4-17
Mechanical time fuze, M565	4-16
Metric chart	Inside back cover
Micrometer test	3-78
Middle yoke (See Recoil yoke assembly (middle))	

Subject **Page**

Misfire and checkfire procedures:
  Definitions 4-39
  General precautions 4-39
  Preventive or corrective procedures 4-40
  Procedures for:
    Cold tube 4-42
    Hot tube 4-44.1
    Warm tube:
      General procedures 4-43
      Special procedures 4-44

Model numbers and color coding of projectiles 4-3

Mount, telescope and quadrant, M171 (See M171 telescope and quadrant mount)

Mount, telescope and quadrant, M172 (See M172 telescope and quadrant mount)

Mounting adapter (See Adapter assembly)

Muzzle brake, PMCS 2-16

Muzzle plug, removal 2-65

M1A1 collimator:
  Emplacing 2-72
  Inspection 3-76
  Maintenance 3-76
  PMCS 2-40
  Replacement 3-76
  Servicing 3-76
  Troubleshooting 3-30

M1A2 aiming posts:
  Emplacing 2-74
  PMCS 2-41

M107 HE projectile, description 4-9

M107C1 HE, 155-mm projectile (NL) 5-5

M107 HE, 155-mm projectile (normal and deep cavity) 5-5

M110 agent H or HD projectiles, description 4-9

M110 and M110E1 WP smoke projectiles, description 4-10

M110A1 (M110E2) and M110A2 (M110E3) WP smoke projectiles, description 4-10

M116 and M116B1 HC smoke projectiles, description 4-10

M116A1 HC smoke projectile, description 4-10

ALPHABETICAL INDEX—Continued

Subject — Page

M119, M119A1, and M119A2 propelling charges:
- Description . . . 4-20
- Maintenance . . . 4-47
- Preparation . . . 4-36

M121A1 GB nonpersistent gas projectile, description . . . 4-10

M121A1 VX persistent gas projectile, description . . . 4-9

M137 panoramic telescope:
- Alinement test with M171 telescope and quadrant mount . . . 3-87
- Checking boresight alinement, using M139 alinement device . . . 2-77
- Controls and indicators . . . 2-9
- Inspection . . . 2-36
- Installation . . . 2-64
- Maintenance . . . 3-75
- PMCS . . . 2-36
- Reliability test . . . 3-86
- Removal . . . 2-104
- Testing . . . 3-75

M138 elbow telescope:
- Alinement . . . 3-75
- Boresighting, using distant aiming point . . . 2-79
- Controls and indicators . . . 2-11
- Inspection . . . 2-38
- Installation . . . 2-67
- Maintenance . . . 3-75
- PMCS . . . 2-38
- Removal . . . 2-105

M139 alinement device:
- Checking boresight alinement of M137 pantel . . . 2-77
- Comparison test . . . 3-89
- Inspection . . . 2-39
- Maintenance . . . 3-76
- PMCS . . . 2-39
- Replacement . . . 3-76

M14 aiming post light:
- Emplacing . . . 2-75
- Inspection . . . 3-77
- Maintenance . . . 3-77
- PMCS . . . 2-41
- Replacement . . . 3-77

M17 fire control quadrant:
- Controls and indicators . . . 2-6
- Inspection . . . 2-34
- Maintenance . . . 3-73

Subject **Page**

M17 fire control quadrant:—Continued
  PMCS: ... 2-32
    Daily ... 2-47
    Weekly ... 3-73
  Servicing ... 3-82
  Testing ...

M171 telescope and quadrant mount: ... 3-87
  Alinement test with M137 pantel ... 2-6
  Controls and Indicators ... 2-34
  Inspection ... 2-63
  Leveling ... 3-74
  Maintenance ...
  PMCS: ... 2-32
    Daily ... 2-47
    Weekly ... 3-74
  Servicing ...

M172 telescope and quadrant mount: ... 2-8
  Controls and indicators ... 2-34
  Inspection ... 2-66
  Leveling ... 3-74
  Maintenance ...
  PMCS: ... 2-34
    Daily ... 2-48
    Weekly ... 3-74
  Servicing ...

M18 fire control quadrant: ... 2-8
  Controls and indicators ... 2-34
  Inspection ... 3-73
  Maintenance ...
  PMCS: ... 2-34
    Daily ... 2-48
    Weekly ... 3-73
  Servicing ... 3-82
  Testing ...
... 4-28
M18 fuze-setter wrench ...

M198 howitzer: ... 2-54
  Emplacing ...
  Firing: ... 2-92
    Direct fire missions ... 2-83
    Indirect fire missions ... 2-107
  Hooking to prime mover ...
  Laying for direction and elevation: ... 2-92
    Direct fire missions ... 2-83
    Indirect fire missions ... 2-68
  Laying, using M2 aiming circle ...
  Loading: ... 2-92
    Direct fire missions ... 2-83
    Indirect fire missions ...

ALPHABETICAL INDEX—Continued

Subject **Page**

M198 howitzer:—Continued
- Placing in stowed position 2-109
- Positions:
  - Firing 1-7
  - Stowed 1-8
  - Towed 1-8
- Preparation for towing 2-99

M199 cannon:
- Controls and indicators 2-1
- Destruction (See Destruction of equipment)
- Inspection 3-31
- Maintenance 3-31
- PMCS 2-42
- Repair 3-32
- Servicing 3-32
- Troubleshooting 3-16

M2 aiming circle, using to lay howitzer 2-68

M2 flash reducer, description 4-21

M203 series propelling charge:
- Description 4-20.1
- Maintenance 4-47
- Preparation 4-36

M3 and M3A1 propelling charges:
- Description 4-19
- Maintenance 4-46
- Preparation 4-35

M3C1 propelling charge (NL) 5-8

M39 carriage:
- Controls and indicators 2-2
- Destruction (See Destruction of equipment)
- Inspection 3-53
- Maintenance 3-53
- PMCS 2-24
- Raising 2-101
- Servicing 3-53
- Traverse limits, traversing beyond 2-97
- Troubleshooting 3-22

M4, M4A1 and M4A2, propelling charges:
- Description 4-19
- Maintenance 4-46
- Preparation 4-35

Subject ... Page

M4C3 propelling charge (NL) ... 5-8

M449 series ICM projectile, description ... 4-12

M45 recoil mechanism:
  Controls and indicators ... 2-2
  Inspection ... 3-49
  Maintenance ... 3-49
  PMCS:
    Daily ... 2-22
    Weekly ... 2-43
  Servicing ... 3-49
  Troubleshooting ... 3-21

M483A1 ICM projectile:
  Description ... 4-12.1
  Special instructions ... 4-38

M485A1 and M485A2 illuminating projectiles, description ... 4-11

M501A1 and M501 mechanical time and superquick fuzes:
  Description ... 4-15
  Procedure number 5 ... 4-35

M549 and M549A1 HERA projectile, description ... 4-11

M557C1 point-detonating fuze (NL) ... 5-6

M557/M572 point detonating fuze:
  Description ... 4-14.1
  Procedure number 1 ... 4-30

M564 mechanical time and superquick fuze:
  Description ... 4-16
  Procedure number 3 ... 4-31

M565 mechanical time fuze:
  Description ... 4-16
  Procedure number 3 ... 4-31

M577 series and M582 series mechanical time and superquick fuzes:
  Description ... 4-17
  Procedure number 4 ... 4-33
  Special preparation for firing ... 4-29

M582 mechanical time and superquick fuze:
  Description ... 4-17
  Procedure number 4 ... 4-33

M692 ADAM, HE projectile, description ... 4-12.1

ALPHABETICAL INDEX—Continued

Subject — Page

M712 HEAT projectile:
  Ammunition prepared for firing, but not fired ... 4-62
  Checkfire procedures ... 4-57
  Description ... 4-13, 4-50
  Extractor assembly operation ... 4-57
  Inspection ... 4-51
  Misfire procedures ... 4-57
  Preparation for firing ... 4-56
  Unloading ... 4-61
  Unpackaging ... 4-51
  Maintenance ... 4-64
  Maintenance (humidity indicator periodic check) ... 4-51

M718 RAAMS HE projectile, description ... 4-12.2

M728 variable time proximity fuze:
  Description ... 4-17
  Procedure number 2 ... 4-31

M731 ADAM HE projectile, description ... 4-12.1

M732 variable time proximity fuze:
  Description ... 4-18
  Procedure number 2 ... 4-31

M739 or M739A1 point-detonating fuze:
  Description ... 4-15
  Procedure number 1 ... 4-30

M741 RAAMS HE projectile, description ... 4-12.2

M82 primer:
  Description ... 4-20.2
  Preparation for firing ... 4-22

M804 practice projectile, description ... 4-14

M823 training projectile:
  Description ... 4-13
  Inspection ... 4-55
  (See also M712 HEAT projectile)

M825 WP smoke projectile, description ... 4-13

M90 chronograph ... 2-94.2

Subject Page

N

Name, common 1-1

Name, official 1-1

Nomenclature cross-reference list 1-1

Nonpersistent gas projectile, GB M121A1 4-10

Notification of EOD personnel (misfire/checkfire) 4-41

O

Obturator spindle assembly and parts: 3-45
  Inspection 3-46
  Installation 3-43
  Maintenance 3-43
  Removal 3-45
  Servicing 3-45

Official nomenclature 1-1

Oil level, checking 3-66

Oil reserve indicator, troubleshooting 3-22

Oil valve assembly: 3-51
  Inspection 3-51
  Maintenance 3-51

Operating speed shift assembly 2-97

Operation: 2-114
  Unusual conditions: 2-114
    Extreme cold weather 2-115
    Extreme hot weather 2-117
    Fording 2-116
    Hot, damp, and salty atmosphere 2-116
    Terrain 2-116
  Usual conditions 2-53

P

Panoramic telescope, M137 (See M137 panoramic telescope)

Pantel (See M137 panoramic telescope)

Performance data 1-12

Persistent gas projectile, VX, M121A1 4-9

Personnel, duties 2-53

ALPHABETICAL INDEX—Continued

Subject . . . Page

Plug, lifting . . . 4-26

Plug, muzzle (See Muzzle plug)

PMCS (See Preventive maintenance checks and services)

Pneumatic tires, destruction (See destruction of equipment)

Point-detonating fuze:
  DM211 (GE and NO) . . . 5-6
  M557/M572 . . . 4-14.1
  M557C1 (NL) . . . 5-6
  M739 . . . 4-15

Powder increments, destroying . . . 4-48.1

Power booster assembly:
  Inspection . . . 3-70
  Maintenance . . . 3-70
  Servicing . . . 3-70

Practice projectile, M804 . . . 4-14

Prefiring checks . . . 2-82

Preliminary commands and formations to form the section:
  To call off . . . 1-17
  To change posts . . . 1-17
  To dismount . . . 1-19
  To fall in . . . 1-16
  To mount . . . 1-18
  To post . . . 1-19

Preparation for firing . . . 4-21

Preparation of howitzer for towing . . . 2-99

Preventive maintenance checks and services (PMCS):
  Daily . . . 2-13
  Procedures . . . 2-12
  Weekly . . . 2-42

Prime mover:
  Hooking to howitzer . . . 2-107
  Unlatching . . . 2-56

Primer, inspection after removal (misfire/checkfire) . . . 4-41

Primer, M82 (See M82 primer)

Procedure number 1, fuzes, M557 and M739 . . . 4-30

Subject — Page

Procedure number 2, fuzes, M728 and M732 4-31

Procedure number 3, fuzes, M565 and M564 4-31

Procedure number 4, fuzes, M577 series and M582 series 4-33

Procedure number 5, fuze, M501 series 4-35

Projectile and fuze combinations, authorized 4-5

Projectile and propelling charge combinations, authorized 4-6

Projectiles:
- Authorized 4-4
- Authorized (NATO) 5-1
- Color coding 4-3
- Deep-cavity 4-27, 5-5
- Descriptions 4-9
- Maintenance 4-45
- Model numbers 4-3
- Preparation for firing 4-22
- (See also specific model number)

Propelling charge and projectile combinations, authorized 4-6

Propelling charges:
- Authorized 4-19
- Authorized (NATO) 5-7
- Maintenance 4-46
- Preparation 4-35
- Preparation for firing 4-22
- (See also specific model number)

Protection, noise level 2-89

Proximity fuze, variable time:
- M728 4-17
- M732 4-18

Purpose of fire control alinement tests 3-78

Q

Quadrant, fire control, M17 (See M17 fire control quadrant)

Quadrant, fire control, M18 (See M18 fire control quadrant)

Quadrant, gunner's (See Gunner's quadrant)

ALPHABETICAL INDEX—Continued

Subject　Page

R

RAAMS, HE projectile:
- M718 .... 4-12.2
- M741 .... 4-12.2

Radiation hazard warning .... a

Radioactive materials warning (See Radiation hazard warning)

Range card 2-93

Range plate, direct fire 2-93

Reassembly (See individual part)

Recoil cylinder assemblies:
- Inspection 3-50
- Maintenance 3-50

Recoil mechanism (See M45 recoil mechanism)

Recoil mechanism rails:
- Inspection 3-52
- Maintenance 3-52
- Servicing 3-52

Recoil rails (See Recoil mechanism rails)

Recoil yoke assembly (front):
- Inspection 3-51
- Maintenance 3-51
- (See also Front yoke assembly)

Recoil yoke assembly (middle):
- Inspection 3-52
- Maintenance 3-52

Recommending improvements i

Records, maintenance 1-1

Recuperator cylinder assembly:
- Inspection 3-50
- Maintenance 3-50
- Troubleshooting 3-22

Reduced crew drill 1-20

References A-1

Reliability test of M137 panoramic telescope 3-86

Subject Page

Removal (See individual part)

Repair (See individual part)

Replacement (See individual part)

Replenisher cylinder assembly, troubleshooting 3-22

Reporting equipment improvement recommendations (EIR's) 1-1

Reporting errors and recommending improvements i

Right trail (See Trail (right))

Rod assembly:
  Inspection 3-69
  Maintenance 3-69

Round, unfired, unloading 2-95

Round, sticker, unloading 2-94.3

S

Salty atmosphere 2-116

Screw assembly, elevating (See Elevating screw assembly)

Section drill 1-15

Section, duties, direct fire missions 2-94.1

Selector valve (SPEEDSHIFT):
  Inspection 3-66
  Maintenance 3-66

Selector valve (WHEELS):
  Inspection 3-66
  Maintenance 3-66

Service hose assembly:
  Inspection 3-70
  Maintenance 3-70
  PMCS 2-30

Servicing (See individual part)

Sign guide, stowage and E-1

Sleeve bearing assembly:
  Inspection 3-50
  Maintenance 3-50
  Servicing 3-50

ALPHABETICAL INDEX—Continued

Subject **Page**

- Smoke projectile:
  - HC, M116 and M116B1 4-10
  - HC, M116A1 4-10
  - WP:
    - M110 and M110E1 4-10
    - M110A1 (M110E2) and M110A2 (M110E3) 4-10
    - M825 4-13

- Spades:
  - Attaching to trails 2-58
  - Emplacing 2-65
  - Inspection 3-69
  - Maintenance 3-69
  - Preparation for towing (howitzer) 2-99
  - Servicing 3-69

- Speed shift assembly:
  - Inspection 3-67
  - Maintenance 3-67
  - Operating 2-97
  - Troubleshooting 3-26

- Spindle assembly, obturator (See Obturator spindle assembly)

- Sticker round, unloading 2-94.3

- Storage of ammunition 4-49

- Stowage and sign guide for components of end item, basic issue items, and applicable additional authorization list items E-1
  - General E-1
  - Scope E-1
  - Stowage and sign guide E-1

- Stowed position of M198 howitzer 2-109

- Supplementary charge, preparation for firing 4-28

- Supplies, expendable D-1

- Suspension system, PMCS 2-44

- Symptom index 3-15

T

- Table of contents i

Subject Page

Telescope and quadrant mount, M171 (See M171 telescope and quadrant mount)

Telescope and quadrant mount, M172 (See M172 telescope and quadrant mount)

Telescope, elbow, M138 (See M138 elbow telescope)

Telescope, panoramic, M137 (See M137 panoramic telescope)

Terms, definitions of 1-6

Test of gunner's quadrant:
- End-for-end test 3-79
- Micrometer test 3-78

Testing M17 and M18 fire control quadrants 3-82

Tests:
- Alinement of M171 telescope and quadrant mount and M137 pantel 3-87
- Gunner's quadrant 3-78
- M139 alinement device comparison 3-89
- M17 and M18 fire control quadrants 3-82
- Reliability of M137 panoramic telescope 3-86

Thermal warning device:
- Controls and indicators 2-1
- Inspection 3-33
- Maintenance 3-33
- PMCS 2-16
- Troubleshooting 3-16
- Using 2-81

Tires:
- For emergency use 3-62
- Problems in extreme hot weather 2-115
- (See also Wheel and tires)

Top carriage:
- Controls and indicators 2-4
- Inspection 3-59
- Maintenance 3-59
- Servicing 3-59
- Troubleshooting 3-23

Towing preparation 2-99

Trail (left):
- Inspection 3-71
- Maintenance 3-71
- Servicing 3-71

ALPHABETICAL INDEX—Continued

Subject **Page**

- Trail lock, unlocking 2-57
- Trail (right):
  - Inspection 3-72
  - Maintenance 3-72
  - Servicing 3-72
- Trails:
  - Closing 2-106
  - Opening 2-57
  - PMCS 2-46
- Training projectile, M823 4-13
- Travel lock assembly:
  - Inspection 3-54
  - Maintenance 3-54
  - Servicing 3-54
  - Taking out of travel lock position 2-60
  - Travel position 2-100
- Travel lock, gun tube 3-71
- Traversing beyond carriage traverse limits 2-97
- Traversing handwheel:
  - Controls and indicators 2-3
  - Inspection 3-59
  - Maintenance 3-59
  - Troubleshooting 3-23
- Traversing mechanism:
  - Controls and indicators 2-3
  - PMCS 2-28
  - Troubleshooting 3-23
- Troubleshooting:
  - Introductory information 3-14
  - Symptom index 3-15
  - Table 3-16
- Trunnions, leveling 3-81
- Tube:
  - Misfire procedures:
    - Cold 4-42
    - Hot 4-44.1
    - Warm:
      - General procedures 4-43
      - Special procedures 4-44
      - (See also M199 cannon)

Subject **Page**

TWD (See Thermal warning device)

U

Unfired round, unloading 2-95

Unloading a sticker round 2-94.3

Unloading an unfired round 2-95

Unusual terrain conditions 2-116

Using the thermal warning device 2-81

V

Variable time proximity fuze:
  M728 4-17
  M732 4-18

Vehicular Taillight:
  Inspection 3-77
  Installation 2-108.2
  Maintenance 3-77
  Removal 2-60

VX persistent gas projectile, M121A1 4-9

W

Warm tube misfire procedures:
  General 4-43
  Special 4-44

Warning page a

Weekly preventive maintenance checks and services 2-42

Wheel and axle:
  PMCS:
    Daily 2-31
    Weekly 2-45

Wheel and tires:
  For emergency use 3-62
  Inspection 3-60.1, 3-64
  Installation 3-64
  Removal 3-63
  Replacement 3-63

Wheel lock handles, operation 2-61

Wheels:
  Lever, operation 2-60.1
  Lowering 2-101
  Troubleshooting 3-25

ALPHABETICAL INDEX—Continued

Subject	Page
WP smoke projectile:	
M110 and M110E1	4-10
M110A1 (M110E2) and M110A2 (M110E3)	4-10
M825	4-13
Wrench, fuze-setter, M18	4-28

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HANGE
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HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC 30 December 1988

Operator's Manual
(Crew)
for
HOWITZER, MEDIUM, TOWED:
155-MM, M198
(1025-01-026-6648)

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1-13 through 1-20	1-13 through 1-20
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2-1 and 2-2	2-1 and 2-2
2-5 and 2-6	2-5 and 2-6
2-13 and 2-14	2-13 and 2-14
None	2-14.1 and 2-14.2
2-15 through 2-48	2-15 through 2-48
2-53 through 2-60	2-53 through 2-60
2-60.1/(2-60.2 blank)	2-60.1/(2-60.2 blank)
2-61 and 2-62	2-61 and 2-62
2-65 and 2-66	2-65 and 2-66
2-69 through 2-80	2-69 through 2-80
None	2-80.1/(2-80.2 blank)
2-81 through 2-84	2-81 through 2-84
2-84.1 and 2-84.2	2-84.1 and 2-84.2
2-85 and 2-86	2-85 and 2-86
2-86.1/(2-86.2 blank)	2-86.1/(2-86.2 blank)
2-87 and 2-88	2-87 and 2-88
2-91 through 2-94	2-91 through 2-94
2-95 through 2-100	2-95 through 2-100
2-100.1/(2-100.2 blank)	2-100.1/(2-100.2 blank)
2-101 and 2-102	2-101 and 2-102
2-103 through 2-108	2-103 through 2-108
2-108.1 and 2-108.2	2-108.1 and 2-108.2
2-109 through 2-116	2-109 through 2-116
2-119/(2-120 blank)	2-119/(2-120 blank)
3-17 and 3-18	3-17 and 3-18
3-18.1/(3-18.2 blank)	3-18.1/(3-18.2 blank)
3-19 and 3-20	3-19 and 3-20
3-21 through 3-26	3-21 through 3-26

Remove pages	Insert pages
3-31 through 3-34	3-31 through 3-34
3-37 and 3-38	3-37 and 3-38
3-41 through 3-44	3-41 through 3-44
3-47 through 3-50	3-47 through 3-50
3-53 through 3-60	3-53 through 3-60
3-60.1/(3-60.2 blank)	3-60.1/(3-60.2 blank)
3-61 through 3-64	3-61 through 3-64
3-64.1/(3-64.2 blank)	3-64.1/(3-64.2 blank)
3-65 through 3-72	3-65 through 3-72
3-77 and 3-78	3-77 and 3-78
3-81 and 3-82	3-81 and 3-82
3-82.1/(3-82.2 blank)	3-82.1 and 3-82.2
4-3 through 4-8	4-3 through 4-8
4-8.1 and 4-8.2	4-8.1 and 4-8.2
4-9 through 4-12	4-9 through 4-12
4-12.1 and 4-12.2	4-12.1 and 4-12.2
None	4-12.3/(4-12.4 blank)
4-13 and 4-14	4-13 and 4-14
4-17 and 4-18	4-17 and 4-18
4-23 through 4-26	4-23 through 4-26
4-29 through 4-32	4-29 through 4-32
4-35 through 4-40	4-35 through 4-40
4-45 through 4-48	4-45 through 4-48
4-49 through 4-65/(4-66 blank)	4-49 through 4-65/(4-66 blank)
A-1 and A-2	A-1 and A-2
B-3 through B-6	B-3 through B-6
B-6.1/(B-6.2 blank)	None
B-7 through B-10	B-7 through B-10
None	B-11 and B-12
D-1 through D-4	D-1 through D-4

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TM 9-1025-211-10
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Washington, DC 9 September 1986

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(Crew)
for
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155-MM, M198
(1025-01-026-6648)

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a and b	a and b
i through iv	i through iv
1-1 through 1-8	1-1 through 1-8
1-11 through 1-16	1-11 through 1-16
1-19 and 1-20	1-19 and 1-20
None	1-20.1/(1-20.2 blank)
2-11 through 2-46/2-52	2-11 through 2-48
2-53 through 2-60	2-53 through 2-60
None	2-60.1/(2-60.2 blank)
2-61 through 2-68	2-61 through 2-68
2-71 through 2-76	2-71 through 2-76
2-79 through 2-94.2	2-79 through 2-94.2
2-95 through 2-100	2-95 through 2-100
None	2-100.1/(2-100.2 blank)
2-103 and 2-104	2-103 and 2-104
2-107 through 2-108.1/(2-108.2 blank)	2-107 through 2-108.2
2-109 through 2-118	2-109 through 2-118
None	2-119/(2-120 blank)
3-15 through 3-18	3-15 through 3-18
3-19 and 3-20	3-19 and 3-20
3-21 through 3-28	3-21 through 3-28
3-31 through 3-34	3-31 through 3-34
3 41 through 3-44	3-41 through 3-44
3-47 through 3-60	3-47 through 3-60
None	3-60.1/(3-60.2 blank)
3-61 through 3-64	3-61 through 3-64
None	3-64.1/(3-64.2 blank)
3-65 through 3-78	3-65 through 3-78

Remove pages	**Insert pages**
3-81 and 3-82	3-81 and 3-82
None	3-82.1/(3-82.2 blank)
3-83 and 3-84	3-83 and 3-84
4-1 through 4-18	4-1 through 4-18
4-20.1 through 4-22	4-20.1 through 4-22
4-25 through 4-30	4-25 through 4-30
4-32.3 through 4-36	4-32.3 through 4-36
4-41 through 4-44	4-41 through 4-44
4-45 and 4-46	4-45 and 4-46
None	4-65/(4-66 blank)
None	5-1 through 5-9/(5-10 blank)
5-1 through 5-4	6-1 through 6-4
A-1 and A-2	A-1 and A-2
B-1 through B-6	B-1 through B-6
B-7 through B-10	B-7 through B-10
C-1 and C-2	C-1 and C-2
D-1 through D-3/(D-4 blank)	D-1 through D-4
None	E-1 through E-5/(E-6 blank)
Index 1 through Index 30	Index 1 through Index 30

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Operator's Manual
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2-101 and 2-102	2-101 and 2-102
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2-107 and 2-108	2-107 and 2-108
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Headquarters
Department of the Army
Washington, DC, 18 July 1985

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None	2-94.3/(2-94.4 blank)
4-5 through 4-8	4-5 through 4-8
4-8.1/(4-8.2 blank)	4-8.1/(4-8.2 blank)
4-35 and 4-36	4-35 and 4-36
4-39 and 4-40	4-39 and 4-40
Index 25 and Index 26	Index 25 and Index 26
Index 29 and Index 30	Index 29 and Index 30

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TM 9-1025-211-10
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CHANGE

NO. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 31 May 1983

Operator's Manual
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(1025-01-026-6648)

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Remove pages	**Insert pages**
i and ii	i and ii
2-83 and 2-84	2-83 and 2-84
4-3 thru 4-8	4-3 thru 4-8
4-8.1/ (4-8.2blank)	4-8.1/ (4.8.2 blank)
4-11 and 4-12	4-11 and 4-12
4-12.1 and 4-12.2	4-12.1 and 4-12.2
4-13 and 4-14	4-13 and 4-14
4-19 and 4-20	4-19 and 4-20
4-20.1/ (4.20.2 blank)	4-20.1/ (4-20.2 blank)
4-21 and 4-22	4-21 and 4-22
4-31 and 4-32	4-31 and 4-32
4-32.1 thru 4-32.4	4-32.1 thru 4-32.4
4-33 thru 4-36	4-33 thru 4-36
4-41 and 4-42	4-41 and 4-42
4-49 thru 4-64	4-49 thru 4-64
B-5 and B-6	B-5 and B-6
B-9 and B-10	B-9 and B-10
Index 3 and Index 4	Index 3 and Index 4
Index 19 and Index 20	Index 19 and Index 20
Index 20.1/ (Index 20.2 blank)	Index 20.1/ (Index 20.2 blank

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METRIC CHART

UNITS OF MEASURE

When units of length, distance, temperature, weight, torque, or pressure are used in this manual, US customary and metric units are shown. US customary units are shown first with the equal metric units shown in parentheses.

When units identify weapons or ammunition, they stand alone.

For example: "5.56 mm"

The list below shows the differences between US customary and metric units with symbols.

US CUSTOMARY	METRIC
LENGTH AND DISTANCE	
inch: 1 in.	25.40 mm: millimeters or 2.54 cm: centimeters
foot: 1 ft	30.48 cm or 0.30 m: meter
yard: 1 yd	91.44 cm or 0.91 m
mile: 1 mi	1.61 km: kilometers
miles per hour: 1 mph	1.61 km/hr: kilometers per hour
TEMPERATURE	
degree Fahrenheit: 1° F	0.555° C: degree Celsius
WEIGHT	
ounce: 1 oz	28.35 g: grams
pound: 1 lb	0.45 kg: kilogram
ton: 1	907.18 kg: kilograms
TORQUE	
inch-pound: 1 in.-lb	0.11 N-m: Newton/meter
PRESSURE	
pounds/square inch: 1 psi	0.07 kg/cm²: kilograms/centimeters squared

Units of time and angle are the same for US customary and metric systems.
No equal units are shown for seconds, minutes, hours, degrees of angle, and mils.

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